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# A mixed methods study of a technology-based self-monitoring intervention

Kari Lynn Vogelgesang  
*University of Iowa*

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A MIXED METHODS STUDY OF A TECHNOLOGY-BASED SELF-MONITORING  
INTERVENTION

by

Kari Lynn Vogelgesang

A thesis submitted in partial fulfillment  
of the requirements for the Doctor of Philosophy  
degree in Teaching and Learning (Special Education) in the  
Graduate College of  
The University of Iowa

August 2015

Thesis Supervisor: Assistant Professor, Allison Bruhn

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Graduate College  
The University of Iowa  
Iowa City, Iowa

CERTIFICATE OF APPROVAL

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PH.D. THESIS

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This is to certify that the Ph.D. thesis of

Kari Lynn Vogelgesang

has been approved by the Examining Committee for  
the thesis requirement for the Doctor of Philosophy degree  
in Teaching and Learning at the August 2015 graduation.

Thesis Committee:

\_\_\_\_\_  
Allison Bruhn, Thesis Supervisor

\_\_\_\_\_  
John Hosp

\_\_\_\_\_  
Pamela Wesely

\_\_\_\_\_  
Liz Hollingworth

\_\_\_\_\_  
Suzanne Woods-Groves

To my parents, Dave and Judy Vogelgesang, whose support and encouragement was the foundation of this endeavor.

To my boys, Griffen and Charlie, my motivation and purpose.

## ACKNOWLEDGEMENTS

I am fortunate to have so many people in my life who have supported and encouraged me as I pursued my doctorate. I would like to recognize my committee (Dr. Allison Bruhn, Dr. John Hosp, Dr. Pamela Wesely, Dr. Liz Hollingworth, and Dr. Suzanne Woods-Groves) for their time, energy, wisdom, and assistance throughout this process. I am particularly grateful for the knowledge and experience my chair, Dr. Allison Bruhn, provided me over the last two years.

The accomplishment of this degree would not have been possible without my family. My parents' commitment to my children and me have allowed me to pursue and obtain this dream. My boys, Griffen and Charlie, provided me the motivation, love, and comedic relief I needed to stay grounded, maintain focus, and forge ahead. I am thankful to my friends: Kiersten Hensley, William Coghill-Behrends, and Sally Huddle for their emotional support, words of advice, and patience throughout this process. I also extend a sincere appreciation to my partner, Jeremy Mims, for his endless love and encouragement.

## **ABSTRACT**

In this study, I aimed to build on a line of research focused on using technology-based, self-management interventions for students experiencing behavioral difficulties in a classroom setting. I analyzed the effects of an iPad application (app) called SCORE IT (Bruhn, Goin, & Hasselbring, 2014) on the behavior of three, fifth grade students with, or at risk of an emotional and behavioral disorder (EBD) who were exhibiting low rates of academic engagement in a general education environment. I also aspired to gain an in-depth understanding of a teacher's perceptions of the feasibility and value of the intervention, SCORE IT.

This study was conducted using an embedded, experimental mixed methods design. Quantitative data using direct observation of student behavior was graphed and analyzed to determine if a functional relation existed between SCORE IT and student behavior (academic engagement). Qualitative data, consisting of teacher interviews and electronic journal entries, were merged with quantitative data from the Intervention Rating Profile 15 (IRP-15) and analyzed to assess the extent to which the teacher perceived the intervention to be practical and valuable. Overall, the SCORE IT intervention resulted in significant improvements in academic engagement and teacher perceptions of the feasibility and worth of the intervention were reported as highly favorable. Study limitations and future directions for research are discussed.

## **PUBLIC ABSTRACT**

There were two primary objectives of this study, (1) to examine the extent to which an iPad, self-monitoring intervention, *SCORE IT* (Bruhn, Goin & Hasselbring, 2014), impacted the academic engagement of three, 5th grade students in a general education classroom, and (2) to comprehensively analyze the teacher perceptions of the usability and value of the intervention.

The extent to which the intervention altered the academic engagement of the student participants was determined by directly observing the change in academic engagement with the absence or presence of the intervention. In other words, when the student is using the intervention, does academic engagement improve?

To obtain an honest and rich analysis of how practical and valuable the teacher perceived *SCORE IT*, both quantitative and qualitative data were collected and examined. This data-set was comprised of interviews, electronic journal entries, and scores obtained from a teacher completed survey (IRP-15) designed to assess participant satisfaction of an intervention.

Overall, the *SCORE IT* intervention resulted in significant improvements in academic engagement and teacher perceptions of the feasibility and worth of the intervention were reported as highly favorable. Study limitations and future directions for research are discussed.



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## **CHAPTER 1: INTRODUCTION**

In 1975, Public Law 94-142 was enacted by the United States Congress to ensure that children with disabilities have the opportunity to receive a free and appropriate public education (FAPE), just as their typically developing peers. In 1990, Public Law 94-142 was renamed the Individuals with Disabilities and Education Act (IDEA). To date, IDEA includes six main principles: (1) *The zero reject principle* states that no child, regardless of the nature or severity of their disability, may be excluded from public education; (2) *The nondiscriminatory and evaluation principle*, affirms that to determine if a child has a disability or whether they qualify for special education, the school must use a nonbiased and multifactored testing and evaluation system which does not discriminate on the basis of race, culture, or language; (3) *A free and appropriate public education* declares that all children with disabilities must be provided, without cost to the child's parents, an appropriate education which may include an individualized education program (IEP) to meet the unique needs of each student with a disability; (4) *The least restrictive environment (LRE) principle* mandates that students with disabilities be educated with children without disabilities to the maximum extent appropriate and that students with disabilities be removed to separate classes or schools only when the nature or severity of their disabilities is such that they cannot receive an appropriate education in a general education classroom with supplementary aids and services; (5) *Due process safeguards* were written into IDEA to protect the rights of children with disabilities and their parents. This includes, obtaining parental consent for all evaluations and placement



decisions regarding special education, while also maintaining the confidentiality of all records pertaining to a child with disabilities. In addition, if the school and the parents of a child with a disability disagree on the results of an evaluation or a placement, the parents may request a due process hearing; (6) *The parent and student participation and decision making principle* articulates that the parents', and when appropriate, the student's, input and wishes must be considered in IEP goals and objectives, service needs, and placement decisions (Turnbull & Cilley, 1998; Turnbull, 2005).

Under IDEA there are 13 different disability categories in which 3-21 year olds may qualify for special education services. Students with an emotional or behavioral disorder (EBD) may qualify in the category of *Emotional Disturbance (ED)*. IDEA (2004) has identified five core characteristics for classifying a student with ED: (1) an inability to learn that cannot be explained by intellectual, sensory, or health factors, (2) an inability to build and maintain healthy relationships with peers and teachers, (3) the presence of inappropriate types of behaviors and feelings under normal circumstances, (4) the persistence of unhappiness or depression, and (5) a tendency to develop physical symptoms or fears related to personal problems either in or outside of the school setting. Furthermore, a student must exhibit one or more of these characteristics to a marked degree, over an extended period of time, while adversely impacting the student's educational performance.

Although the disability category ED also includes schizophrenia, it does not apply to students who are determined to be "socially maladjusted." Because IDEA does not provide a definition for social maladjustment, discriminating between ED and socially

maladjusted can be subjective and troubling for educational professionals who are helping to determine eligibility for special education services (Kauffman & Landrum, 2009). Proponents of this clause argue that youth considered to be socially maladjusted are not truly disabled, but instead deliberately choosing to violate the rules (Merrell & Walker, 2004). Those who oppose the clause report that without a valid method for discriminating between these two labels, it makes it difficult, if not impossible, to objectively determine if a student qualifies for services under the ED category (Kauffman & Landrum, 2009).

Other professional agencies and associations use different eligibility criteria and labels for youth with ED. Their definitions cover a broad array of mental health conditions, some of which may also lead to eligibility under IDEA. For example, the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-5) contains descriptions of specific characteristics that are used to determine whether a child or adult has a mental, emotional, or behavioral disorder. Some of the disorders listed in the DSM-5 include: attention deficit/hyperactivity disorder, disruptive mood dysregulation disorder, oppositional defiant disorder, intermittent explosive disorder, and conduct disorder. Regardless of the specific label that may be given to a set of emotional or behavioral characteristics, many mental health professionals discuss these labels under the umbrella category of emotional and behavioral disorders (EBD; PACER, 2006). Characteristics of EBD may be dichotomized as externalizing or internalizing behaviors. Examples of externalizing behaviors may include aggression, disruption, noncompliance, and defiance; internalizing behaviors

include depression, anxiety, and withdrawal, among others (Rutherford, Quinn, & Mathur, 2004). However, these categories are not mutually exclusive meaning people can exhibit comorbid characteristics.

Over the years, researchers have focused on studying how characteristics associated with an EBD impact a student's behavior in a classroom setting (Carr & Punzo, 1993; Mooney, Epstein, Reid & Nelson, 2003; Ollendick & King, 1994; Rutherford, Quinn, & Mathur, 2004; Umbreit, Lane, & Dejud, 2004). Findings suggest that students with an EBD have a particularly difficult time demonstrating a developmentally appropriate level of self-control, attending to instruction, connecting new information to previous experiences, and creating/maintaining a productive work environment (Barnard-Brak, Sulak & Fearon, 2011; Carr & Punzo, 1993; Carter, Lane, Crnabori, Bruhn & Oaks, 2011; Gillberg et al., 2004; Kauffman & Landrum, 2009; Mooney, 2003). These types of school struggles are often demonstrated through low academic performance, low rates of academic engagement, and high rates of negative peer and teacher interactions, (Bruhn, McDaniel, & Kreigh, 2015; Mooney et al., 2003; Umbreit, Lane, & Dejud, 2004). These unfavorable student outcomes have highlighted a need for further research examining how students with an EBD can be better supported in both a general and special education environment.

### **Need for the Study**

Over 2 decades ago, the U.S. Department of Education funded a National Longitudinal Transition Study (NLTS) to investigate the experiences of America's youth as they transitioned from one stage of their lives (school-age) to the next (young adults).

The authors of this study highlighted that youth receiving services under the ED category experienced higher rates of academic failure, a more pronounced disconnectedness to the school community, and higher rates of interactions with the criminal justice system compared to any of the other 13 disability categories found under IDEA. For example, it was identified that nearly 38% of the students in the sample had been held back a grade, 75% had been suspended or expelled from school, and 40% had attended five or more schools since kindergarten. It was also reported that youth with ED were at greater risk of dropping out of school as compared with students in other disability categories; in 1999-2000 nearly 51% of students with ED age 14 and older dropped out of school (U.S. Department of Education, 2002). Similarly, Wagner et al (2005) reported that students with ED also differed from their typically developing peers in more ways than just their disability. For example, youth with ED were more likely to live in poverty, live in a single parent household, and live in a home where the head of household had not obtained any formal post-secondary education.

In terms of the types of supports that students with, and risk of an EBD receive, it is critical to highlight that only about 1% of students enrolled in public schools within the United States actually receive special education services under the ED category (U.S. Department of Education, 2005). The Department of Health and Human Services (2001), along with current researchers, (Forness, Kim, & Walker, 2012) estimate the actual point prevalence of EBD is at least 12%. Presuming this estimate of 12% more accurately depicts the EBD population in our K-12 public schools, it is conceivable that the majority of students with an EBD are receiving all of their education and school experience in the

general education classroom. To this end, general education teachers must be equipped with evidence-based strategies that are practical and feasible for working with this population in a large classroom setting.

In sum, this population of students are more likely than any other disability group to struggle both academically and socially, in and out of school (Landrum, Tankersley & Kauffman, 2003; Lehr & McComas, 2005; Sinclair, Christenson & Thurlow, 2005). Thus, further efforts are needed to improve social and academic outcomes for students with, and at risk for EBD.

### **Purpose of the Study**

The dismal academic and social outcomes that have been reported for students with and at risk of an EBD have spawned a shift in focus amongst EBD stakeholders (Lehr & McComas, 2005; Sinclair, Christenson & Thurlow, 2005; Wagner, Newman, Cameto, & Levine, 2005; Landrum, Tankersley & Kauffman, 2003). Rather than arguing over labels, categories, and definitions, educational professionals, researchers, and parents have advocated it is far more important to determine what types of interventions are the most useful to support students with an EBD (PACER, 2006) . In fact, in a recently published article, Kauffman & Landrum (2009) stated, “There is no doubt among professionals in the field of EBD that students identified with, or at risk, for EBD demand qualitatively different instruction and behavior management interventions if they are to succeed in school” (p.46) It is arguments such as this, coupled with the dismal academic and social outcomes reported for students with EBD, which provides a purpose for this study.

In an attempt to help provide “qualitatively different...behavior management interventions” (Kauffman & Landrum, 2009) I assessed the impact of a self-determination intervention (i.e., self-monitoring) aimed to teach a metacognitive strategy (the process of thinking about thinking) to improve academic engagement for students with, or at risk of an EBD (Menzies, Lane & Lee, 2009). Self-determination, as defined by Field et al., (1998) is a “combination of skills, knowledge, and beliefs that enable a person to engage in goal directed, self-regulated, autonomous behavior” (p.2).

Categorized under the umbrella term self-determination, falls self-management. Self-management interventions are used to help students change or maintain a behavior (Martella, Nelson, & Marchand-Martella, 2003; Mooney, Ryan, Uhing, Reid, & Epstein, 2005). These interventions have been identified as an evidence-based intervention for improving both academic and behavioral outcomes for students with, and at risk of an EBD (Bruhn & Watt, 2012, Christensen, Young, & Marchant, 2004; Mooney, et al., 2005). There are five types of self-management interventions: self-monitoring, self-evaluation, self-instruction, goal-setting, and strategy instruction. Often, self-management interventions include more than one component. For example, the Bruhn, Vogelgesang, Schabilion, Waller, & Fernando, (in press) study of a technology-based self-monitoring intervention for students with problem behaviors performing below grade level in reading, included four components: (1) self-monitoring, (2) goal-setting, (3) teacher feedback, and (4) reinforcement. Self-monitoring interventions involve two critical steps: (1) the student must be able to clearly identify the occurrence of the target (problem) behavior, and (2) the student needs to self-record some aspect of the target behavior

(Mooney et al., 2005). This study specifically focuses on a technology-based self-monitoring intervention.

### **Technology with Self-Monitoring**

Whereas there is substantial research focusing on self-management interventions for students with an EBD, and in spite of the massive surge of technology devices in K-12 classrooms (Hew & Brush, 2007), there are few empirical studies investigating the use of technology with these interventions (Baker, Lane, & O'Reilly, 2009; Bruhn, McDaniel, & Kreigh, 2015; Bedesem, 2012; Gulchak, 2008; Szwed & Bouck, 2013; Wills & Mason, 2014). In addition, as federal, state, and local legislation continues to emphasize the need for data-based decisions to drive instruction as well as the type and frequency of services provided to individuals with a disability (NCLB, 2001; IDEA, 2004), both practitioners and researchers acknowledge the need for technology-based devices and methods to assist with the process of collecting and analyzing data to address academic and behavioral goals (Wagner et al., 2006).

Traditional self-monitoring interventions use paper and pencil to record the presence or absence of a target behavior. Paper/pencil recording systems can be time consuming (i.e., they require manual compilation and computation for graphing data) and are susceptible to damage (Bedesem, 2012). Furthermore, researchers who study self-monitoring interventions are concerned that because these interventions typically include multiple components (paper/pencil recording sheets, overt cuing system, graphing paper, and calculator) they limit the student to using the intervention within the classroom (Bedesem, 2012). It is hypothesized that a technology-based self-monitoring

intervention, which includes all of the components of a self-monitoring intervention (cuing, recording, calculating, graphing and goal-setting) into one device, will provide opportunities for students to self-monitor in multiple settings (i.e., playgrounds, lunchrooms, hallways, etc.). A call for future research has been made to examine the potential that technology devices and programs offer in relation to how to record, graph, calculate, analyze, store and make instructional decisions based on behavioral data (Baker, 2009; Bedesem, 2012; Bruhn et al., 2015; Gulchak, 2008; Szwed & Bouck, 2013).

### **Research Questions**

The specific research questions guiding this study include:

1. To what extent does the use of the self-monitoring iPad app, *SCORE IT*, improve the academic engagement of adolescent students with behavior problems?
2. What are teacher perceptions of the goals, procedures, and outcomes (i.e., social validity) of *SCORE IT*, before, during and after implementation of intervention?



## **CHAPTER 2: LITERATURE REVIEW**

The purpose of this chapter is to provide a review of the literature relevant to this study. The chapter begins with a description of and support for using interventions which target self-management of students with, or at risk of an EBD. A definition of the terms self-management and self-monitoring is provided and a detailed description of evidence-based classroom self-monitoring interventions follows. Next, evidence of the limited empirical research focusing on how technology has been used with and/or has impacted self-monitoring interventions in an educational setting is detailed. Finally, relevant to the secondary research question, research on teacher perceptions of technology and the value and purpose of using qualitative methods to investigate perceptions concerning the importance and feasibility of interventions is presented.

### **Self-Determination, Self-Management and Self-Monitoring**

#### **Self-Determination**

For the purposes of this study, the definition for self-determination offered by Field, Martin, Miller, Ward and Wehmeyer (1998) will be used. This definition is arguably one of the most commonly used definitions for self-determination in published literature. Field et al. (1998) defined self-determination as:

A combination of skills, knowledge, and beliefs that enable a person to engage in goal-directed, self-regulated autonomous behavior. An understanding of one's strengths and limitations together with a belief in oneself as capable and effective are essential in self-determination. When acting on the basis of these skills and attitudes, individuals have greater ability to take control of their lives and assume the role of successful adults in society. (p. 2)

Over the past few decades, researchers have offered convincing evidence that it is critical educators afford students with an EBD additional instruction focusing on self-determination (Carter et al., 2011; Mooney, et al., 2005; Wagner et al., 2005). In addition, to further strengthen self-determination skills, this additional instruction should be comprised of evidence-base interventions that are implemented with fidelity.

Commonly identified components of self-determination include: (1) choice making, (2) decision making, (3) goal setting, (4) self-evaluation, (5) problem solving, (6) self-knowledge, (6) self-advocacy, (7) self-evaluation, (8) self-management, and (9) self-regulation (Wehmeyer & Field, 2007). In other words, self-determination is an umbrella term encompassing multiple skills. In a comprehensive literature review focusing on self-determination interventions for students with, and at risk for an EBD, Carter and colleagues (2011) concluded that self-management and self-regulation were the most frequently researched self-determination interventions (65.4% of included studies).

### **Self-Management**

As defined by Thompson and colleagues (2013), self-management is “a set of strategies that students are trained in to assess, monitor, and evaluate their own behavioral performance” (p. 3). More specifically, a self-management intervention must include one or more of the following elements: (1) self-selecting a target behavior, (2) self-defining the target behavior, (3) self-determining a performance goal, (4) self-identifying reinforcers, (5) self-prompting a behavior, (6) self-monitoring a target behavior, (7) self-recording of the target behavior, (8) self-charting/graphing of the target

behavior, (9) self-appraising performance of the replacement behavior, (10) self-administering primary reinforcers, and/or (11) self-administering secondary reinforcers (Fantuzzo et al., 1988). To summarize, self-management interventions often involve multiple components working in tandem to facilitate a student becoming aware of his/her behavior.

**Mooney, Ryan, Uhing, Reid & Epstein (2005).** In a literature review including 22 studies, in 20 peer-reviewed publications, including 78 participants, Mooney and colleagues (2005) analyzed both the effectiveness of academic self-management interventions of children and adolescents with an EBD, as well as the various settings where these interventions were implemented. Students ranging from ages 5 to 12 were included in the studies. In the majority of the studies ( $n = 18$ ) participants were identified as EBD by school-based procedures. In the remaining 4 studies, the researchers did not specify the procedures used to identify the student participants. This review produced six major findings. First, authors found that the effects of self-management interventions produced a significant gain in educational outcomes. The mean effect size (ES), of all self-management interventions included in the 22 studies, was 1.80. Compared to Cohen's (1988) definition of a large effect size (.80), it is evident that self-management interventions have the ability to improve academic achievement for students with EBD.

Second, authors found that whereas there were a wide variety of self-management strategies (self-monitoring, goal setting, self-evaluation, self-instruction, strategy instruction, and multi-component interventions) implemented with the participating students, self-monitoring interventions were more frequently used than any other self-

management technique. In addition, self-monitoring interventions were implemented across content areas (e.g., reading, math) and were found to have a large ES (1.90), meaning they produced higher than average effects (mean ES of all interventions = 1.80) when compared to the other self-management strategies included in the review. While self-monitoring was found to be the most widely used self-management technique, goal-setting was the least used ( $n = 1$ ). This indicates a need for future researchers to analyze the impact that goal-setting has on academic outcomes for students with EBD.

A third finding reported was that 50% of the studies in the review assessed math outcomes. This limited the range with which the authors could assess the impact that self-management interventions had on academic outcomes across content areas. Because such a large number of studies implemented self-management interventions focusing on math outcomes, the authors reported, “some confidence that self-management interventions will benefit students with EBD in the areas of math calculation, work productivity, and developing fluency with newly learned mathematical concepts.” (p. 216) Recommendations were made for future research across all content areas, particularly in reading, citing that only four of the studies included in the review targeted reading improvement.

Another important finding of this review was that the majority of the interventions were conducted in either a self-contained or resource classroom (68%). With nearly 75% of students with EBD receiving the bulk of their education within an inclusive environment (U.S. Department of Education, 2002), the settings in which the interventions were implemented and tested were not reflective of where most students

with EBD receive instruction. This finding suggests a need to analyze the effects self-management interventions in a general education environment.

The Mooney et al. (2005) review also highlighted the limited number of group design studies that had been conducted and published in peer-reviewed journals. Only two group design studies were included in the review and both of these studies had been published over 20 years prior to the publication of the review. The majority of the studies (90%) used a single-subject design to answer the research questions. Whereas it is true that single-subject research is a powerful methodology to analyze the impact that interventions have on either academic or behavioral outcomes (Horner et al., 2005), it is also true that to fully develop a line of research, it is desirable for both group and single-subject research designs to be present in the literature (Hoagwood, Burns, & Weisz, 2002; Walker, 2000).

Another meaningful finding communicated in the review was that both the generalization and maintenance of self-management interventions were “largely positive” (p. 217). This indicates that not only were self-management interventions found to be effective at increasing academic outcomes for students with EBD, but the students were also able to generalize the skills they learned to other settings or content areas.

Furthermore, the authors of this review declared that collectively, the students included in these studies were able to maintain positive outcomes after the intervention was removed.

**Briesch & Chafouleas (2009).** In 2009, Briesch and Chafouleas conducted a review of self-management literature examining 30 studies, including 16 different self-management interventions. This review of literature aimed to examine the specific types

of self-management strategies that were being used with students in a classroom setting as well as the effects these strategies had on behavior, as opposed to academic performance. A total of 106, school-age children, of normal intelligence, in either regular or special education classrooms participated across all 30 studies. In three of the studies, students without “exceptionalities” (p. 110) were targeted, however 70% ( $n = 16$ ) included students diagnosed with learning disabilities (LD), 50% ( $n = 15$ ) included students diagnosed with behavioral disorders, and 17% ( $n = 5$ ) included students diagnosed with ADHD.

Overall, Briesch and Chafouleas (2009) reported their findings were congruent with previous claims that self-management strategies are an effective tool to increase student performance. An important finding of this review was that across all studies, two components of self-management interventions were nearly always included: (a) self-observation of a previously identified and defined target behavior, and (b) self-recording of that behavior. The authors declared these two components (self-observation and self-recording) were the “cornerstones” (p. 115) of self-management interventions. Furthermore, they called for future researchers to consider these findings when providing a definition of self-management interventions.

Another goal of this review was to determine which self-management strategies were most effective in changing behavior. Unfortunately, the authors provided three reasons for their inability to draw any strong conclusions regarding the extent to which particular self-management techniques changed behavior. First, self-management strategies are often included in a packaged intervention (i.e., more than one strategy is

included in the intervention), making it impossible to separate out the effects of individual components. Second, because there is limited research on the extent to which individual self-management techniques impact behavior, the authors resolved that more research is needed to justify conclusions “regarding value” (p. 115). Third, less than one-third ( $n = 7$ ) of the studies included an evaluation of treatment integrity, raising question regarding whether or not the intervention was implemented as intended. This is particularly troubling considering that the studies which assessed treatment integrity reported (on average) a lower ES than those studies which did not include a treatment integrity component. The authors called for additional research on the effects of self-management interventions on student performance, particularly behavioral outcomes.

Briesch and Chafouleas (2009) also expressed concern for the limited data reported on social validity (the extent to which the participants deem the intervention valuable). Research supports that an association exists between the social validity of an intervention and the fidelity in which it is implemented (Greenwood & Abbott, 2001; Horner et al., 2005; Finn & Sladeczek, 2001; McDuffie & Scruggs, 2008). In other words, the more valuable and feasible the students and teachers view the intervention, the more likely the intervention will be carried out as planned.

Upon consideration of the findings from the Mooney et al. (2005) and Briesch and Chafouleas (2009), it is clear the authors of both reviews found self-management interventions improved student academic and behavioral outcomes. The noted recommendations for future research in these two reviews included: (1) further examination and documentation of treatment integrity, (2) examination of the impact that

social validity has on student outcomes, (3) the effects that independent self-management techniques have on student performance, and (4) the impact self-management interventions have on student outcomes when implemented in general education environments.

Because the purpose of the current study is to examine the effects of a self-monitoring intervention, the next body of literature reviewed in this chapter targets the published research on the extent to which self-monitoring interventions have impacted student behavioral outcomes in a classroom setting.

### **Self-Monitoring**

Similarly to how self-management falls under the umbrella term of self-determination, self-monitoring is categorized under self-management (Briesch & Chafouleas, 2009). In other words, self-monitoring is a specific component of self-management. Self-monitoring consists of two essential elements: (1) the individual successfully discriminating the target behavior, and (2) the individual self-recording some aspect of the target behavior (Mooney et al., 2005; Nelson & Hayes, 1981; Reid, 1996). Self-monitoring interventions are often combined with one or more of the following four components: (1) positive reinforcement, (2) feedback, (3), teacher mediation, and/or (4) goal setting (Bruhn et al., in press; Harris et al., 2005).

This section of the chapter includes five self-monitoring literature reviews which have helped to provide answers to frequently asked questions concerning the impact of self-monitoring interventions on student outcomes in a classroom setting. In addition, these literature reviews have provided suggestions for future research which has



encouraged progress toward better understanding which variables, under which settings, and for which functions of behavior are self-monitoring interventions most effective.

**Webber, Scheuermann, McCall & Coleman (1993).** In 1993, Webber, Scheuermann, McCall, and Coleman published a literature review comprised of 27 self-monitoring studies and 142 participants. All 27 studies took place in public school settings and focused on self-monitoring interventions used to help manage student behaviors that were indirectly related to academic achievement (i.e., academic engagement, off-task behavior). These authors aimed to answer the following questions: (1) Does self-monitoring result in a behavior rate change with special education students in a public school setting? (2) If so, what variables seem to most influence documented change in behavior? and (3) Is self-monitoring a covert/internalized process or an overt/externally managed technique?

Of the 142 participants, 69% were male and 21% were female. The vast majority of these students (72%) had been diagnosed with either a behavioral disorder and/or a learning disability. The remaining participants fell into one or more of the following categories: hyperactivity, vision impairment, problem behaviors, mental retardation, severely-profoundly handicapped, and/or Chapter 1 services (services provided to “educationally deprived children” who resided in areas with high concentrations of low-income families; ESEA, 1965). Seventy-one percent of the subjects were elementary school students and 29% were in a secondary school environment. Most of the studies (77%) occurred in a self-contained special education classroom while the remaining were conducted in a general education environment.

In terms of the types of behaviors targeted for improvement, 56% were identified as on-task or attending behavior. Other targeted behaviors included: academic productivity, positive statements, appropriate classroom behavior, goal attainment, noncompliance, out-of-seat, inattention, aggression, emotional outbursts, disruptive noise, talking, attention-soliciting, and motor activity. In all of the studies, these behaviors were operationally defined by the researcher based on the activity that was being observed in the classroom.

Twelve of the 27 studies included maintenance probes while only 8 reported the inclusion of generalization probes. Maintenance and generalization probes are used in research to determine if students were able to transfer what they have learned from an intervention (i.e., managing their own behaviors) into settings outside of where the intervention takes place (generalization) and eventually, without any, or with limited external contingencies (maintenance). Of the 20 studies that included either generalization or maintenance probes, only 6 reported that behavior was generalized to other settings or successfully maintained after fading intervention.

In terms of methodology, nearly all of the studies utilized single-subject research designs. Forty-four percent were multiple baseline designs; 26% were reversal designs; 15% were alternating treatment designs, 11% were changing criterion designs, and 4% were AB designs. Two studies were group designs.

The authors of 26 out of 27 studies reported that self-monitoring resulted in a positive change in student behavior. The one study that did not report significant behavior change used a self-monitoring intervention (with self-instruction training) to reduce a

student's "motor activity" (p. 51) during group instruction. Overall, findings of this review indicated self-monitoring interventions were an effective method to increase desirable behaviors and decrease negative behaviors for students with or at risk for EBD in a public school setting. Arguably even more interesting, was that a number of the studies reported self-monitoring not only resulted in an increase in a desirable behavior that was already part of the student's repertoire (they already knew how to perform the behavior), but after participating in self-monitoring, new skills, such as organization of papers and positive statements, emerged.

In accordance with previous and current self-monitoring research, Webber et al. (1993) concurred that the multiple components (reinforcement, positive feedback, corrective feedback) included in self-monitoring interventions makes it extremely difficult, if not impossible, to determine the extent to which each individual component impacts the change in behavior.

In sum, the 3 questions guiding this review were: (1) Does self-monitoring result in a behavior rate change with students in a public school setting? (2) If so, what variables seem to most influence the change in behavior?, and (3) Is self-monitoring a covert/internalized process or an overt/externally managed technique? Of these 3 questions, the examination of whether or not self-monitoring can be internalized and successfully used as a self-managed skill was the most inconclusive. Even though there were six studies in which self-monitoring was faded and the replacement behavior was maintained, in all six studies there were multiple external classroom variables confounding the positive maintenance results. In other words, it was not possible to

conclude whether self-monitoring had been internalized or if a combination of variables were responsible for maintaining the desired behavior.

**Sheffield & Waller (2010).** In 2010, Sheffield and Waller conducted a review of the self-monitoring literature to determine: (1) the various behavioral issues for which self-monitoring has shown to be effective, (2) successful strategies for implementing self-monitoring interventions, and (3) to determine if there were specific self-monitoring implementation “strategies for teachers.” (p. 8). This review included 16 studies, all of which were conducted using a single-case research design. A wide range of participant ages (ages 8-15) and disabilities were included in these studies. The range of disabilities consisted of: a learning disability, severe emotional disturbance, Down syndrome, ADHD, mental retardation, at risk for school failure, and comorbid disabilities.

All of the studies took place in a general education classroom setting with the majority of the studies occurring in a typical public school environment ( $n = 14$ ). Across all 16 studies, the research was conducted in one of the following types of classrooms: study hall, general education, special education resource room, and general education inclusion classroom.

Behaviors targeted for monitoring were associated with attention (e.g., on-task behavior) or academic performance, with the majority focusing on attention ( $n = 15$ ). Overall, and in accordance with the findings of the previously described self-monitoring literature reviews, the authors found that the self-monitoring interventions included in this review reported having a positive effect on behavioral outcomes when used alone or as a component of an intervention package.

Sheffield & Waller (2010) also reported all studies included a training component for participants prior to implementation of intervention. The most common training components incorporated during these sessions were: modeling, practice, and opportunities for feedback and questions. Although not discussed by Sheffield and Waller (2010), future research assessing the contribution of intervention training on the success of self-monitoring interventions seems valuable.

In this review, it was determined 11 of the 16 studies reported social validity findings, however Sheffield and Waller (2010) highlighted that reports of social validity were minimized to a single statement, (i.e., participants and teachers found their respective interventions to be acceptable). Additional information about how social validity was assessed and specific perceptions about the goals, outcomes, and procedures would be valuable in determining which elements of the intervention may be most helpful and/or difficult for both student and teacher.

Another limitation reported in the Sheffield and Waller (2010) review was that only seven studies reported treatment integrity. Without treatment integrity, it is difficult to know if the intervention was implemented as intended or as described and if outcomes can be accurately attributed to the intervention. Additionally, none of the studies reported generalizability findings and only four provided information regarding maintenance probes. Overall, Sheffield and Waller (2010) reported that collectively, the 16 studies suggested self-monitoring was a highly-effective strategy for students with problem behaviors in a classroom setting.

**Joseph & Eveleigh (2010).** Joseph and Eveleigh (2010) examined 16 studies to determine the impact of self-monitoring interventions on reading performance with K-12 students with disabilities. Seven of the studies included in this review used some form of a single-subject design to conduct their study. The remaining nine studies used either a group design, pretest-posttest with random assignment to treatment conditions, or a quasi-experimental design. Across all studies there were 302 participants. Most of the participants were reported as have a learning disability (60.3%) or EBD (14.9%). The remaining participants were reported as having a speech/language impairment, ADHD, or had a comorbid diagnosis including two or more of the above disabilities.

Most of the dependent variables measured in these studies included one or more of the following: reading accuracy, reading productivity, academic engagement during reading, responding to comprehension questions, recalling main ideas, oral passage reading, word identification, and/or number of reading miscues. In all 16 studies, participants used daily recording sheets or cards to self-monitor reading progress, and nearly all of the self-monitoring interventions involved additional intervention components (e.g., feedback, reinforcement, goal setting).

In half of the studies ( $n = 8$ ) the authors calculated the percentage of nonoverlapping data (PND). PND is one way to calculate an effect size for single-subject data and is equal to the percentage of treatment data points that do not overlap between baseline and successive intervention phases. The greatest PND reported was on accuracy measures (88%-93%;  $n = 2$  studies) and on-task reading behavior (86%-100%;  $n = 1$  study). An overall mean ES of 1.74 for students with learning disabilities, with smaller,

but still significant effects reported for other student characteristics (e.g., ADHD, EBD). Based on these calculations, Joseph and Eveleigh (2010) determined self-monitoring interventions had a positive effect on reading outcomes for students with disabilities (ES = 1.46). However, this statement was tempered because nearly all 16 studies employed different metrics to determine effect sizes. Authors suggested future research was needed to determine if there were differential effects on reading skills, specifically between self-monitoring on-task reading behavior and self-monitoring of reading accuracy (the two largest reported effect sizes across all studies included in the review).

Another noteworthy finding was that self-monitoring was not only determined to be successful in managing skills that were already familiar to the participating students, but was also reported as having a positive impact on helping students learn new content and skills (e.g. organization of papers, raising your hand to speak, reading comprehension). This seems particularly significant considering that 17 years prior, Webber et al. (1993) reported similar findings in that self-monitoring resulted in a positive change to behavior that was already part of the student's repertoire (they already knew how to perform the behavior), as well as prompting new skills to emerge.

In contrast to the Webber et al. (1993) review, the studies included in the Joseph and Eveleigh (2010) literature review did not report positive results regarding students' ability to maintain improved behavior upon fading of intervention. In other words, when self-monitoring was faded or no longer used, a decline in reading performance followed. Future research examining the maintenance of academic performance when intervention is faded or removed is needed.

Converse to maintenance findings, Joseph and Eveleigh (2010) determined that students successfully demonstrated an ability to generalize reading tasks to other content areas. Specifically, students had the most success of generalizing positive behaviors when the intervention included reading strategy training plus self-monitoring. Even though self-monitoring studies focusing on behavior reported similar generalization findings, it would be helpful to determine which specific components of self-monitoring interventions contribute the most to the generalization of desired outcomes.

In accordance with previous self-monitoring reviews, Joseph and Eveleigh (2010) reiterated that self-monitoring interventions implemented in a naturalistic environment (K-12 school setting), include multiple extraneous variables, and are typically bundled with several independent variables (e.g., feedback, reinforcement, goal setting). For these reasons, it makes it extremely difficult, if not impossible, to parse the specific intervention elements, student characteristics, and environmental factors that account for the greatest change in behavior.

Joseph and Eveleigh (2010) did not report any data or information from any of the studies related to participant satisfaction or perceptions of the interventions. As a means to address the feasibility of intervention implementation and maintenance of behavior, it would be beneficial to not only look to quantitative measures of social validity but for researchers to address these questions using a qualitative approach (Leko, 2014). As Leko (2014) asserted, qualitative designs are able to provide “in-depth, holistic, examinations of phenomenon in natural settings with participants’ voices” (p. 35).



Finally, with regards to limitations of self-monitoring interventions, Joseph & Eveleigh (2011) emphasized that they were, “surprised to discover that technological tools (e.g., clickers and other portable computer devices) for monitoring reading performance were not examined in studies” (p. 50). This observation is congruent with the findings of Bruhn et al. (2015) in their review of 41 self-monitoring studies. Both of these reviews posited there is a need for future research to examine the impact of mobile technology in conjunction with self-monitoring interventions on the behavior and/or academic performance of students in K-12 settings.

**Bruhn, McDaniel, & Kreigh (2015).** In a more recent review of the self-monitoring literature, Bruhn et al. (2015) examined 41 studies, published from 2000-2012, all of which identified the independent variable (IV) as a self-monitoring intervention. The studies in this literature review included a total of 231 participants with documented behavioral problems who represented a wide range of grades, settings, and behaviors. More specifically, authors examined: (1) the characteristics of the students who participated in the study, (2) the types of settings in which self-monitoring interventions have been implemented, (3) the methodology used to determine behavioral effects, (4) the roles reinforcement, feedback, behavioral function, and technology played in the interventions, and (5) the degree to which these additional components (reinforcement, feedback, function, and technology) impacted outcomes of the interventions.

The first two variables examined in this review were the characteristics of the students participating in the study and the setting in which the self-monitoring

interventions took place. Of the 231 participants, 193 were male and 38 were female. All of the participating students had demonstrated, “sustained patterns of problem behavior warranting referral for intervention” (p. 12). Of the studies that reported special education status, 85 of the 231 students were identified with one or more of the following disorders: attention deficit disorder (ADHD), EBD, a LD and/or Other Health Impairment (OHI; one of the 14 disability categories listed under IDEA). Based on previously published self-monitoring literature, (Coutinho & Oswald 2005; Coutinho, Oswald, & King, 2001; Piechura-Couture, Heins, & Tichenor, 2011) it was not surprising that males represented an overwhelming majority (84.5%) of the participants in the studies. It was, however, unexpected to find that so few of the participants were identified as having a disability or receiving special education services (36.7%). This may be an indication of the service gap that has been identified between individuals receiving services for learning disabilities as opposed to those who receive services for an EBD (Forness, Kim, & Walker, 2012). With regards to what types of settings were represented across these forty-one studies, all of them took place in a K-12 setting and within a wide range of schools and classrooms (i.e., general education environments, inclusive classrooms, self-contained rooms, resource rooms, charter schools, alternative schools, and traditional public education schools).

In terms of methodology, thirty-nine of the forty-one studies were conducted using single-subject research design (e.g., ABAB, ABAC, alternating treatment, multiple-baseline, etc.). A group design was utilized in one study in which participants were randomly assigned to a control or experimental group. Another was reported as not

having specified the research design. Eighteen of the 41 studies did not report measurement of treatment fidelity (the degree to which the participants are using the intervention as designed and intended). Seventeen of the studies in the review reported treatment fidelity using a quantitative index (e.g., mean percentage, range) and the remaining six studies mentioned fidelity but did not quantify it.

In terms of what specific variables were measured in the studies, Bruhn et al. (2015) reported on task behavior as the most common dependent variable (DV;  $n = 22$ ). Other frequently measured variables included: disruptive behavior ( $n = 6$ ), negative or inappropriate social interactions ( $n = 4$ ), and academic engagement ( $n = 4$ ).

The presence or absence of generalization and maintenance data were two more elements related to methodology that were examined in the review. Generalization probes (the extent to which positive behaviors learned in the intervention generalize into various settings) were included in 8 of the 41 studies. Thirty-two of the studies reported the presence of maintenance programming (i.e., systematically fading the intervention once a certain degree of proficiency of the replacement behavior was reached). Bruhn et al. (2015), suggested it would be beneficial for more studies to include generalization and maintenance probes as well as treatment fidelity data. The authors of this review highlighted that generalization and maintenance data are necessary to determine which interventions are more likely to generalize across settings and which are easily maintained and/or thinned without decreasing positive effects. Bruhn et al. (2015) also explained that reports of treatment fidelity data are essential to analyze how or if fidelity

of intervention implementation is intersecting with the generalizability and maintenance of various interventions.

As stated earlier in this chapter, self-monitoring interventions often include a reinforcement element (Bruhn et al., 2015; Harris, et al., 2005; Mooney et al., 2005; Reid et al., 2005; Rock, 2005; Shimabukuro et al., 1999). Bruhn et al. (2015) not only analyzed whether reinforcement was present in each of the interventions, but they attempted to expand the self-monitoring literature by examining the specific intervention factors that reinforcement was made contingent upon: (1) meeting a pre-determined goal, (2) following a procedure, or (3) recording behavior accurately. In twenty-five of the –forty-one studies, students received reinforcement (e.g., candy, sticker, praise, etc.) as part of the intervention. In 1 of these twenty-five studies, reinforcement was non-contingent, meaning that reinforcement was delivered regardless of whether the student participant met his/her behavior goal or accurately recorded his/her behavior. In over half of these studies ( $n=13$ ) reinforcement was contingent upon accurate recording of behavior (e.g., students behavior scores matched those of the researchers or the teachers) and in eleven studies reinforcement was delivered contingent upon goal achievement (e.g., academically engaged, for 70% of instructional time) or successfully following procedures (e.g., homework turned in on time in every class).

Bruhn et al. (2015) also noted that in all studies including a reinforcement component, regardless of whether or not the reinforcement was contingent, authors of the studies reported positive changes in student behavior. In four of these studies, self-monitoring with and without reinforcement was compared directly. Of these four studies,

three of them indicated more positive effects when reinforcement was included. Only one of the four studies comparing self-monitoring with and without reinforcement did the authors indicate there was not a significant difference in behavior based on the presence of reinforcement.

Because of the large number of studies ( $n=25$ ) including reinforcement in self-monitoring interventions, authors hypothesized researchers and practitioners “likely view this (reinforcement) as an essential component of self-monitoring.” (p. 26). In addition, contingent reinforcement appeared to demonstrate better results with improving behavior as compared to non-contingent reinforcement. More specifically, reinforcing students for accurate ratings or following procedures may be more effective than reinforcing students irrespective of accuracy or procedural compliance. Bruhn et al. (2015) concluded that future research examining the most effective methods for fading reinforcement was needed.

The unique contribution that feedback has on self-monitoring interventions was another question driving the Bruhn et al. (2015) review. As previously articulated, feedback (i.e., praise, encouragement, instruction, or correction) is a typical component included in self-monitoring interventions (Harris et al., 2005). Bruhn et al. (2015), reported that twenty-five out of forty-one of the studies included feedback as part of the self-monitoring intervention. In these twenty-five studies, the feedback was delivered to the student by 1 of the following persons: the teacher, researcher, observer, school psychologist, peer, teacher’s aide, or therapist. Only one of these twenty-five studies used a component analysis (ABCBC single-subject design) to directly analyze the effects of

feedback on the student's behavior, which indicated a decrease in disruptive and off-task behavior when feedback was present. However, Bruhn et al., (2015) determined that the results of the component analysis study were confounded by the use of reinforcement (i.e., candy, sticker, break) with feedback. Because only one study directly analyzed the impact feedback had on self-monitoring (ABCBC single-subject design), it is necessary for future researchers to not only examine the specific effects feedback has when used as part of a self-monitoring intervention, but to also to examine the relationship between feedback and function (e.g., does feedback work better when addressing behaviors maintained by access to attention or escape from task?).

Next, Bruhn et al. (2015) examined the forty-one studies to determine if the researchers incorporated function-based support as part of the intervention process. Function-based assessments aim to use data to predict what variables in the environment may be triggering or maintaining a behavior (Alberto & Troutman, 2012). In eight of the forty-one studies, functional behavior assessments were used to: (a) determine what was prompting or maintaining the problem behavior, and (b) design an intervention which addressed the function of the behavior (to access or escape something). All eight studies included, at minimum, one participant who had a behavior that functioned to access attention. The other behavior function that was represented was task avoidance. The authors suggested that future research examining the intersection of feedback and reinforcement with the function of various behaviors is critical to understanding which elements of self-monitoring interventions may have a greater impact on improving behaviors serving specific functions.

Finally, authors reported that the use of technology to monitor and/or record behavior was rare. Bruhn et al. (2015) identified several technological devices that were used to prompt self-monitoring (e.g., timers, cell phones, Motivator), however only two studies incorporated the use of technology to record behavior and none of the studies used technology to store, calculate and/or graph the data. Considering the increased presence that technology has in K-12 schools, as well as the potential that technology has to offer (Hew & Brush, 2007), it is surprising that technology did not play a larger role (i.e., prompting, recording, aggregating the data, and graphing the data for analysis) in the self-monitoring interventions included in this review.

The most frequent limitations reported in the self-monitoring literature included: (a) limited documentation of treatment integrity, (b) minimal reports of generalization and maintenance data, (c) a need to further examine the unique contributions of various self-monitoring components (particularly the component of reinforcement), (d) insufficient analysis of social validity, and (e) an inadequate number of studies including technology with self-monitoring. Excluding the call for more studies to include and examine the role that technology plays in self-monitoring interventions, the limitations most often reported in the self-monitoring literature aligned with the summary of the limitations reported in the self-management review of literature.

Because the present study is examining the effects of a technology-based self-monitoring intervention, a more detailed review of literature focusing on the types of technology-based self-monitoring interventions that have been implemented in K-12 classrooms follows.

## **Technology used with Self-Monitoring Interventions**

As previously mentioned, it was surprising that the number of published studies utilizing technology to prompt, record and/or aggregate classroom behavior data does not reflect the increase in both the presence and use of technology in K-12 schools (Bedesem, 2012; Bruhn et al., in press; Hew & Brush, 2007). The lack of technology used with self-monitoring interventions has prompted a call to further analyze the impact that technology may have on self-monitoring interventions in a classroom setting (Bruhn & Watt, 2012).

Complications with traditional paper/pencil self-monitoring procedures have been reported as difficult to sustain in a classroom environment highly susceptible to human error with regards to recording, calculating, graphing, and storing data (Bedesem, 2012; Gulchak, 2008). For example, using traditional self-monitoring procedures, a student and/or teacher typically documents, on a piece of paper, the occurrence or nonoccurrence of a problem behavior for a series of intervals (i.e., using a tally count, checking a “yes” or “no” box, etc.). These data are then converted into a ratio and transferred to a graph for visual analysis. Furthermore, the paper/pencil behavior recording sheets, ratio calculations, and graphs need to be maintained and securely stored. Because self-monitoring interventions include multiple procedural elements (prompting, recording, calculation, graphing, analysis, and storing of data), they can be extremely difficult, if not impossible, for teachers to implement with fidelity when providing instruction and care to an entire classroom full of students (Heckman, Conroy, Fox, & Chait, 2000; Leko, 2014; McDuffie & Scruggs, 2008). In an effort to offer the most parsimonious, efficient, and



user-friendly self-monitoring intervention, for both students and teachers, it would be ideal to house all or most of the self-monitoring procedural components into a single technology-based program.

To date, there are at least five published studies, which have used technology to either record or prompt behavior in a classroom environment (Bedesem, 2012; Bruhn, et al., in press; Gulchak, 2008; Szwed & Bouck, 2013; Wills & Mason, 2014). All five of these studies used a packaged intervention involving multiple components (i.e., reinforcement, goal setting, self-monitoring, etc.).

**Gulchak (2008).** Gulchak (2008) used a single-subject ABAB design to examine self-monitoring of on-task behavior of an 8 year old male with an EBD using a handheld mobile device (i.e., Palm Zire 72). This was the first known investigation to use technology in place of paper/pencil to self-record on-task behavior in a classroom setting (Gulchak, 2008). The handheld device used in this intervention prompted the student to observe and record his behavior directly on the device. As reported by Gulchak (2008), a functional relation was established between the student's behavior and the intervention with mean on-task behavior increasing from 64% to 98%.

Gulchak (2008) reported that at the end of each class period, the student was able to run a report on the device summarizing the number of on-task behavior intervals that were recorded. Whereas this automated feature helps save time and potentially reduces the possibility of calculation error, it did not offer data storage or graphing abilities. For example, after the self-monitoring data was recorded in the device, the student then had to transfer these data manually onto a spreadsheet to view his overall progress. Even

though the results of this study showed positive outcomes and promise for including technology with self-monitoring interventions, the student was still tasked with manually calculating and graphing his data which in turn increased opportunity for error and limited efficiency.

Another limitation presented in this study was that neither generalization nor maintenance probes were included. Without including these probes, it was impossible to determine if the student was able to generalize the replacement behavior into other settings or if he was able to maintain the positive behaviors upon removal or fading of the intervention.

Gulchak (2008) did not report any information regarding the participant's perceptions of value and satisfaction with the intervention. Again, if teachers and/or students do not consider interventions to be practical or valuable, they are not likely to implement or sustain the intervention as intended (Greenwood & Abbott, 2001). Assessing social validity may provide valuable information about how participants view the intervention and whether or not they are likely to continue using it.

**Bedesem (2012).** Bedesem (2012) examined a self-monitoring intervention created using the social networking application, Twitter, installed on a cellular phone. Bedesem (2012) analyzed the impact this technology-based intervention had on the on-task behavior of two middle school students within an inclusive classroom setting. The participants were defined as students: (a) with a high incidence disability, as described by the state of Florida, or who were medically diagnosed with ADHD and were being served under IDEA (2004); (b) included in at least one core general education class; (c) were

teacher-identified as exhibiting off-task behavior at a rate that disrupted academic progress; and (d) had an attendance rate of 90% or higher.

With regards to intervention procedures, every 5-min the participating students received messages from the researcher via private Twitter accounts, prompting them to observe their own behavior and then self-record their behavior via text messaging. The author reported an average on-task behavior increase from 45% to 71%; however, no information was provided regarding the tracking of students' responses or the graphing of data. We are left to assume that as in the Gulchak (2008) study, the student responses were manually transferred and recorded on a graph or spreadsheet to for future analysis. Even though this study was one of the first to incorporate technology into a self-monitoring intervention, there remained potential to capitalize on the full capabilities of technology by creating a technology-based self-monitoring intervention that included all procedural steps (recording, calculating, and graphing).

Other limitations of the Bedesem (2012) study were the exclusion of social validity data, and generalizability and maintenance probes. Again, without this information, it is impossible to determine if: (a) the positive behaviors that resulted from this intervention were generalized into settings outside of where self-monitoring took place, (b) the students were able to maintain positive behaviors upon fading of intervention, or (c) to what extent the participants perceived the intervention to be valuable and feasible, impacting the treatment fidelity and maintenance of the intervention (Lane et al., 2009).

**Szwed & Bouck (2013).** In a third study, Szwed and Bouck (2013) used a single-subject withdrawal design to examine the effects of a technology-based self-monitoring intervention on the on-task behavior of three second grade students, two with ADHD and one with an emotional disability. Szwed and Bouck (2013) repurposed a handheld response system that had been traditionally used to deliver student responses to teacher questions/prompts (a response clicker), into a technology-based self-monitoring intervention. The participating students used the handheld devices to respond to the question, “Am I listening to my teacher and following class expectations?” Students were prompted to answer this question regarding their on-task behavior 10 times during a 50-min period. The authors reported a functional relation between off-task behavior and the intervention.

Szwed and Bouck (2013) included maintenance probes in their study and reported that students did not continue on-task behavior when self-monitoring was not in place. In addition, the authors conducted pre and post student interviews to determine what parts of the intervention they thought they would/did like, dislike, etc. The authors communicated that students felt their classmates viewed them in a more positive manner when using the intervention, however they did not address the extent to which the participants thought this intervention was helpful or practical in their everyday lives.

One limitation of this study is that the teachers were not included in the social validity interviews. Even though it is desirable for students to be motivated to use the intervention, without the willingness of the teacher to put an intervention into effect and

monitor the use and outcomes of the intervention, it is unlikely that the intervention will ever be used, let alone used with fidelity.

As in the previously described studies, no mention of how the student data was stored or graphed was included in the article. The lack of information on this process again leads one to assume that this piece of the intervention was completed using traditional methods (i.e., manually calculated, transferred into a graph, and stored for future reference).

**Wills & Mason (2014).** In a recently published study, Wills and Mason (2014) used a single-case withdrawal design to investigate the impact of a technology-based self-monitoring intervention (I-Connect) on students' on-task behavior in an inclusive general education science classroom. Two participating students were included in this study. One student (age 15) was identified as a Native American male who was receiving services under the classification of specific learning disability. In addition to a learning disability, it was reported that for several years prior to this study, as well as throughout the duration of the study, he had been medicated for ADHD. Despite medication, this participating student was engaging in off-task behavior, contributing to school failure. The second participant was identified as a 14 year-old, white male with ADHD. Again, the teacher and case manager reported that off-task behavior was contributing to failure in school.

The intervention consisted of an Android application (app) called I-Connect which provided scheduled prompts for participants to self-monitor targeted (problem) behaviors. The app was downloaded on a Samsung Galaxy Player 5.0 tablet. Via text, the application provided prompts such as, "Are you on task?" to the student. Even though the

application had the capability of cuing the student through vibration, ring tone, or flashing light, in order to minimize peer distraction, the tone and vibration notifications were disabled during the study and a flashing light was programmed to cue the students to evaluate their on-task behavior on an automated 5-min fixed interval schedule. If the student did not respond to the notification within 6-sec, the flashing light would disappear and the subsequent 5-min. interval was programmed to begin.

Other commonly included self-monitoring components such as feedback, reinforcement, etc., were not bundled with this intervention. In other words, the goal of this study was to examine the impact that self-monitoring alone had on the on-task and disruptive behavior of both student participants.

Both of the dependent variables (i.e., on-task behavior and disruptive behavior) were simultaneously recorded during 15-min sessions using the multiple option observation system for experimental studies (MOOSE; Tapp et al. 1995). Using an ABAB design, authors reported a functional relation between the IV and both DVs with more significant improvements demonstrated in on-task behavior. Student 1's average percent of on-task behavior during baseline condition calculated to 51% and increased to 94% in the final intervention phase. Student 2's average time spent on-task during baseline was reported as 18% compared to that of 91% in the final intervention phase. In terms of disruptive behavior, Student 1's disruptive behavior decreased from an average of 2.2 occurrences per session during the original baseline phase to .4 during reintroduction of intervention. Even more of an impact on disruptive behavior occurred for student 2 with an average of 4.3 occurrences reported in baseline compared to an

average of .6 reported in the final phase of intervention. The positive results on behavior were particularly significant considering that the technology-based self-monitoring intervention was not packaged with other self-monitoring components thus allowing Mills & Mason to analyze the impact that the intervention had on behavior independent of other variables (i.e., reinforcement, feedback).

In terms of social validity, authors reported students completed a researcher-developed form which consisted of five Likert-type items to rate student perceptions regarding ease of use of the intervention as well as an open-ended response item. Teachers completed the Intervention Rating Profile (IRP-15; Martens et al. 1985), consisting of 15 items on a 6-point scale to assess treatment acceptability. Both students and teachers rated the intervention positively with the majority of responses indicating that they “strongly agreed” the intervention was both helpful and easy to use. The authors did not report any findings from the open ended response they included on the student treatment acceptability form.

A major limitation to this study is that the authors did not report if or how the student data were used once the participants recorded their responses to the automated questions within I-Connect. This limitation further identified a need to develop and examine the extent to which an all-inclusive, technology-based self-monitoring intervention could impact student behavior in a classroom setting.

The authors also did not report any data collected from the open-ended responses included on the student social validity survey. Including qualitative data, detailing the strengths and weaknesses of interventions, can help to identify specific components of an

intervention which may be impacting the degree to which the user is implementing and/or maintaining the intervention with fidelity (Greenwood & Abbott, 2001; Horner et al., 2005; Finn & Sladeczek, 2001; McDuffie & Scruggs, 2008).

**Bruhn, A. L., Vogelgesang K., Schabilion, K., Waller, L., & Fernando, J. (in press).** Finally, Bruhn et al. (in press) extended the literature base by examining the effects of an iPad app called *SCORE IT*, on the behavior of two middle school students. This study was the first of its kind to include nearly all procedural elements (i.e. prompting, recording, the calculation and graphing of behavior, and long-term storage) of a self-monitoring intervention into a single technology program.

One of the student participants was a male who had been diagnosed, but was not taking medication for, ADHD. The other participant was a female receiving special education services. Because the Midwestern state in which this study took place was a non-categorical state, the female student was not identified under an IDEA category, but simply as an “eligible individual.” Her Individual Education Plan (IEP) goals focused on reading, math, and behavior. Both of the participating students received their reading instruction in a self-contained *READ 180* classroom, however, they were not in the same *READ 180* class.

The *SCORE IT* app was specifically designed to: (a) assist students with, or at risk, of an EBD to self-record and capture behavior data in automated graphs, and (b) coincide with the Scholastic reading program, *READ 180*. The *READ 180* program was a targeted reading curriculum used at the middle school level for students who were performing below grade level. *SCORE IT* was programmed to follow the instructional



rotations (5 rotations for each class period) of the *READ 180* curriculum. At the end of each rotation, both the participating student and the teacher would rate (using a 5-point scale) student adherence to previously determined and programmed classroom expectations. Based on the teacher ratings, the iPad app, *SCORE IT*, calculated, graphed, and stored student behavior data. Additionally, this app allowed the participants to simultaneously view both the student and teacher ratings which provided an opportunity for teacher feedback to be part of the packaged (multi-component) intervention.

Reinforcement was also included in this technology-based, self-monitoring intervention. Prior to implementation of intervention, the teachers and students identified and agreed upon reinforcers (i.e., candy, tickets for ice cream, etc.) that the teachers would be willing to give and that the students would be willing to work towards. If the students met an individualized percentage of positive behavior (PPB) goal at the end of each class, the student would earn the reinforcer that was previously established.

For both participants, a primary and secondary dependent variable were under examination, however, phase changes were based solely on the visual analysis of the primary dependent variable. Academic engagement (AE) was the primary DV for one participant and talk-outs (TOs) was the primary DV for the other. Both students demonstrated marked improvement in their classroom behavior with average AE for the participant 1 increasing from 48.33% to 82.05% and average TOs for participant 2 decreasing from .81 TOs per minute (about 73 TOs per 90 minute class period) to .24 TOs per minute (roughly 22 TOs per 90 minute class period).

To assess the practicality of the intervention, this study also included a social validity component composed of a pre and post questionnaire. The teachers completed the Intervention Rating Profile-15 (IRP-15; Witt & Elliott, 1985a), a 15-item questionnaire using a 6 point Likert-type scale and the students completed an adapted version of the Children's Intervention Rating Profile (CIRP; Witt & Elliott, 1985b), including 5 statements rated on a 6 point scale. Additional open-ended questions evaluating participants' perceptions of the intervention were added to the end of each of the questionnaires. Not only did the data from these questionnaires indicate that all participants positively viewed the intervention, one of the participating teachers commented that *SCORE-IT* was easier to use than traditional paper/pencil self-monitoring interventions. However, the teacher's experience with paper/pencil methods was not indicated or assessed.

One limitation of the study was that neither maintenance nor generalizability probes were included. The authors noted that future research was needed to determine to what extent participants are able to maintain positive behavior upon fading of intervention, as well as how feasible *SCORE IT* is to implement and sustain in other, less structured, classroom settings.

Across all studies included in this this section, authors called for future research to examine the unique impact that various components of self-monitoring interventions have on behavior as well as additional information regarding perceptions of the interventions (i.e., social validity). These identified gaps in the research provided a justification for this study.

Related to the feasibility (social validity) of implementing and using *SCORE IT* across settings, the next section of this review moves on to analyze the literature base pertaining to the second question driving the current study, *what are teacher perceptions of the goals, procedures, utility, and outcomes (i.e., social validity) of SCORE IT, before, during and after implementation?*

### **Teacher Perceptions Social Validity of Interventions**

This section of the literature review aims to provide background information related to factors influencing teachers' perceptions of technology and the importance of assessing the social validity of interventions. Specifically, this section includes: (1) a review of elements which affect teachers' use of technology in teaching and learning processes (2) a concrete definition of social validity, (3) a rationale for conducting social validity research in the field of education, (4) a summary of the methods that have traditionally been used to assess social validity, and (5) a justification for employing both quantitative and qualitative methods to address this question.

In a review of literature examining factors influencing teachers' adoption and integration of technology into their classrooms, Buabeng-Andoh (2012) identified three main categories that positively or negatively influence teachers' use of technology: (1) personal factors, (2) institutional factors, and (3) technological factors.

In terms of personal factors, Buabeng-Andoh (2012) reported that teachers' feelings, knowledge and attitudes influence their acceptance and usefulness of technology in their classrooms. Buabeng-Andoh (2012) concluded that, "if teachers' attitudes are positive toward the use of educational technology then they can easily provide useful

insight about the adoption and integration of technology into teaching and learning processes” (p. 147).

Regarding institutional factors, things like support, funding, professional development, and facilities impact the teachers’ adoption and integration of various technologies. Buabeng-Andoh (2012) highlighted teacher professional development as a key factor to successful integration of technology into the classroom.

The third category associated with technology use was the technology itself. Buabeng-Andoh (2012) reported that it is essential for teachers to perceive technology as better than previous practice (i.e., value) prior to implementation. Additionally, the ease of use of technology was highlighted as an essential factor influencing the adoption of technology into the classroom. In sum, personal factors, institutional factors, and the technology itself contribute to how teachers perceive technology and subsequently use technology in the classroom. This underscores the importance of social validity when it comes to teacher implementation of technology.

Social validity, according to Wolf (1978), is: (a) the assessment of the social significance of the *goals* of an intervention, (b) the social acceptability of the intervention *procedures*, and (c) the social importance of the *effects* of the intervention. This definition has been widely accepted and used in social validity literature (Finn & Sladeczek, 2001; Kazdin, 1977; Schwartz & Baer, 1991; Van Houte, 1979). It is also the definition that has been adopted for the purposes of this study.

Schwartz & Baer (1991) asserted that in addition to understanding what social validity is, it is also critical that we understand what social validity is not. Schwartz &

Baer (1991) described social invalidity as not simply the absence of positive evaluations of a program, but the understanding of the behaviors displayed by consumers in response to their disapproval of some component of the intervention, (i.e., withdrawing from the program, encouraging others not to participate, complaining, or not implementing some or all of the intervention's procedures). Furthermore, Schwartz & Baer (1991) declared that in order to identify a specific part of a program/intervention that the participant dislikes, it is necessary for cases of social invalidity to be evaluated both individually and critically.

To support this position, Schwartz & Baer (1991) highlighted a consistent finding across reviews of social validity research which evidenced a contradiction between social validity ratings and the fidelity in which the interventions were implemented. It has been documented in social validity research that participants of intervention studies consistently report positive or favorable ratings (via surveys) of the intervention in which they are testing/using for the study. However, follow-up data (via direct observation or interview) often demonstrate a discontinuation of parts or all of the intervention in which the teacher participant had previously awarded high or favorable scores (Bornstein & Rychtarik, 1983; Fuqua & Schwade, 1986; Lebow, 1982; McMahon & Forehand, 1983; Ware, Davies-Avery, & Stewart, 1977). In other words, even when participants are provided ample opportunity to voice concerns and opinions regarding a program, their actions and behaviors towards the intervention, and how they use/maintain the intervention, are often quite different than what they report in a survey. It is for this reason that the second question of the current study both qualitatively and quantitatively

analyzes the teacher perceptions of the intervention, allowing for an in-depth and comprehensive assessment of the social validity of the intervention, *SCORE IT*.

Over the last 40 years, professionals in the field of special education have acknowledged that a relation exists between the social validity of an intervention and the fidelity in which it is implemented (Greenwood & Abbott, 2001; Horner et al., 2005; Finn & Sladeczek, 2001; McDuffie & Scruggs, 2008). That is to say, the more valuable and feasible the consumers (teachers and students) deem the intervention, the more likely the intervention will be implemented as intended. Fidelity of intervention implementation has been documented as, “central to the validity of any intervention study and is closely related to the statistical power of outcome analyses... Failure to establish fidelity can severely limit the conclusions that can be drawn from any outcome (Dumas, et al., 2001; p.39). More simply put, academics who study fidelity of intervention implementation acknowledge that the impact an intervention has on student outcomes depends on the fidelity in which it is implemented (Berman & McLaughlin, 1976; Dumas et al., 2001; O’Donnell, 2008).

Traditionally, social validity assessments have consisted of self-report, paper-and-pencil questionnaires that provide overall ratings of acceptability (Finn & Sladeczek, 2001). As previously mentioned, the outcomes obtained via this method of assessing treatment acceptability have contradicted the actual behaviors of the participants involved in using the intervention. Consequently, Finn & Sladeczek (2001) conducted a comparative review of nine treatment acceptability measures and practices that were developed and used to assess the social validity of behavioral interventions. Authors

aimed to assess these social validity measures with respect to: (a) content and purpose of the instrument, (b) psychometric properties, (c) scoring procedures and interpretation, and (d) use of the measure in research practice. The selection of measures included in the review were derived from “extensive database searches on studies investigating the acceptability of behavioral interventions” (p. 179). The measures included in the review were: (a) Treatment Evaluation Inventory (TEI; Kazdin, 1980), (b) Treatment Evaluation Inventory-Short Form (TEI-SF; Kelley, Heffer, Gresham, & Elliott, 1989), (c) Treatment Acceptability Rating Form (TARF; Reimers & Wacker, 1988) (d), Treatment Acceptability Rating Form-Revised (TARF-R; Reimers et al., 1992), (e) Intervention Rating Profile-20 (IRP-20; Witt & Martens, 1983), (f) Intervention Rating Profile-15 (IRP-15; Martens et al., 1985), (g) Abbreviated Acceptability Rating Profile (AARP; Tarnowski, Simonian, Bekeny, & Park, 1992), (h) Children’s Intervention Rating Profile (CIRP; Witt & Elliott, 1985); and (i) the Behavior Intervention Rating Scale (BIRS; Von Brock & Elliott, 1987). All of the included measures developed questions that targeted a particular consumer (e.g., student, teacher, or parent), and were paired with a Likert-type scale to quantitatively assess the social validation of each intervention.

After statistically analyzing each of the nine measures, Finn and Sladeczek (2001) declared that, “the majority of existing treatment acceptability measures have adequate reliability and validity” (p. 199). However, with support from existing research in this field, Finn & Sladeczek (2001) warned that assessing the social validity of interventions is much more complex than what these treatment acceptability raters are able to offer (Calvert & Johnston, 1990; Spirrisson, Noland, & Savoie, 1992). Furthermore, Finn &

Sladeczek (2001) argued that self-report data alone does not provide a comprehensive and unbiased illustration of an intervention, allowing a researcher or practitioner to draw an honest portrayal of treatment acceptability (Finn & Sladeczek, 2001). Across social validity research, it is recommended that rating scales be used in conjunction with other assessment approaches, such as semi-structured interviews, open-ended questions within a survey, and direct observation of participant interaction with the intervention allowing one to gain a richer and more accurate assessment of social validity (Calvert & Johnston, 1990; Finn & Sladeczek, 2001; Spirrisson et al., 1992).

### **Summary of Literature**

Over the past few decades, researchers have offered convincing evidence that it is critical educators afford students with, or at risk of a disability additional instruction focusing on self-determination (Carter et al., 2011; Wehmeyer & Bolding, 2001; Wehmeyer et al., 2003; Zhang & Law, 2005). This is particularly important for students with, or at risk of an EBD as this population of students often struggle with self-determination skills, such as self-management, more than students in any other disability category (Carter et al., 2011; Mooney, et al., 2005; Wagner et al., 1991). To strengthen self-management skills, self-monitoring has been recommended.

There is a general consensus among researchers that self-monitoring interventions have been successful at reducing problem behaviors, increasing student attention, and increasing student productivity (Bruhn et al., 2015; Harris et al., 2005; Mooney et al., 2005; Reid et al., 2005; Rock, 2005, Shimabukuro et al., 1999). The limitations identified in the self-monitoring literature included: (a) the need for future research to examine the



extent to which individual components of self-monitoring (i.e., reinforcement, feedback, goal setting) impact student behavior, (b) an underrepresentation of technology used with self-monitoring interventions, particularly with regards to automating self-monitoring procedures (recording, calculating, graphing and storing data in real time), and (c) the limited reports of consumer perceptions (i.e. social validity) of the interventions.

The purpose of the current study was to extend the technology-based self-monitoring literature by examining the effects of an iPad application intervention, *SCORE IT*, on the behavior of three adolescent students with documented behavioral difficulties. An additional goal was to comprehensively and systematically analyze the teacher perceptions (i.e., social validity) of the intervention. Research questions included:

1. To what extent does the use of the self-monitoring iPad app, *SCORE IT*, improve the academic engagement of adolescent students with behavior problems?
2. What are teacher perceptions of the goals, procedures, utility, and outcomes (i.e., social validity) of *SCORE IT*, before, during and after implementation of intervention?

## **CHAPTER 3**

### **METHODOLOGY**

In Chapter 3, the methodology used to conduct this study is described. Specifically, this chapter includes: (a) a restatement of the purpose and the research questions, (b) a rationale for the selected methodology (i.e., research design), (c) a summary of the philosophical assumptions which influenced the design, (d) a description of the participants, setting, and the intervention, and (e) an explanation of the procedures for data collection and data analysis.

#### **Restatement of Purpose and the Research Questions**

The primary purpose of this study was to investigate the extent to which a technology-based self-monitoring intervention impacted the academic engagement of three adolescent students with, or at risk of an EBD. The secondary objective was to provide a comprehensive examination of the participating teacher perceptions (i.e., social validity) of *SCORE IT*. The research questions driving this study included:

1. To what extent does the use of the self-monitoring iPad app, *SCORE IT*, improve the academic engagement of adolescent students with behavior problems?
2. What are teacher perceptions of the goals, procedures, utility, and outcomes (i.e., social validity) of *SCORE IT*, before, during and after implementation of intervention?

#### **Rationale for the Selected Research Design**

To appropriately answer the research questions in this study, an embedded, experimental, mixed methods research design was used. This type of design is

traditionally used when qualitative data are needed to answer a secondary question within a predominantly quantitative study (Creswell & Clark, 2011). This section of Chapter 3 includes a detailed explanation of the research design and a rationale for why this design is the best fit for the study.

### **Single-Subject Research**

The primary goal of this study is to determine if a functional relation exists between the intervention, *SCORE IT* (independent variable; IV), and student behavior (dependent variable; DV). To answer this first question, a single-subject, withdrawal design was used. Single-subject research designs are commonly used in the field of special education; particularly when determining whether a causal, or functional relation exists between an IV and a DV (Horner, et al., 2005; Kennedy, 2005). Over the past 40 years, single-subject research has proven to be the standard for analyzing educational practices at the level of the individual (Horner et al., 2005). In fact, Horner et al. (2005) stated, “Single-subject research is a rigorous, scientific methodology used to define basic principles of behavior and establish evidence-based practices.” (p. 165)

Single-subject research typically includes 3-8 participants within a single study (Horner, 2005; Kazdin, 2011; Kennedy, 2005). Each participant serves as his or her own control. Performance prior to intervention is compared to performance during and/or after intervention using repeated measurement. Experimental control is demonstrated and a functional relation is established when the DV (i.e., behavior) changes consistently (at least 3 times in a single study) in relation to the IV (i.e., an intervention).

There are different types of single-subject designs, all used to answer different types of research questions. Some of the most commonly used single-subject designs include: (a) ABAB or withdrawal, (b) multiple-baseline, (c) multi-treatment, (d) changing criterion, and (e) alternating treatment.

In this study, a traditional single-subject withdrawal design (A=Baseline, B=Intervention, A=Withdrawal, B=Intervention) was used to determine if a functional relation existed between *SCORE IT* and the academic engagement of three adolescent students in a general education setting. This type of design provides researchers an opportunity to establish three demonstrations of an experimental effect. That is, three times in a single study a DV covaries with manipulation of the IV between introduction and removal of the intervention.

### **Mixed Methods Research**

To answer the second question of this study, a mixed methods research design was used to gain a rich understanding of how the teacher perceived the intervention, particularly with regards to the feasibility and value (i.e., social validity) of *SCORE IT*. Mixed methods research is a design in which both qualitative and quantitative data are combined to offer a greater “breadth and depth of understanding” of a particular phenomenon (Johnson, Onwuegbuzie, & Turner, 2007; p.123). Merging both the quantitative and qualitative data sets provided an opportunity to offer a deeper analysis of the various factors influencing the teacher’s perceptions of the intervention (e.g., experience with technology, student characteristics, teaching experiences).

The quantitative data set for this study was comprised of direct observation of student behavioral data as well as scores from a social validity Likert-type scale survey, the Intervention Rating Profile (IRP-15; Witt & Elliott, 1985). The qualitative data set included responses from pre and post intervention interviews with the teacher as well as weekly teacher email journals and responses to three opened ended questions on the extended version of the IRP-15.

### **Philosophical Assumption**

Whereas it may not be common practice for quantitative researchers to identify and report the philosophical assumptions influencing the methods chosen to conduct a research study, it is widely practiced and often deemed a necessary element in qualitative research (Creswell & Clark, 2011). As described by Creswell & Clark (2011), all research methods (quantitative, qualitative, and mixed methods) are influenced and guided by a person's previous life experiences and exposure to particular philosophies and theories. Because these past experiences and philosophies inevitably help to shape the way we, as researchers, conduct our studies, qualitative and mixed methods researchers feel it is necessary to identify and disclose the *philosophical assumptions* researchers bring to their work. Crotty (1998) identified four fundamental components of a philosophical assumption: (a) worldview, (b) theoretical lens, (c) methodological approach, and (d) methods of data collection.

The dominant worldview which guided this study was that of a pragmatist. A pragmatist worldview is often associated with mixed methods research and typically focuses on the question(s) being asked rather than the methods used. Pragmatists are

interested in using multiple methods of data collection to gain a rich understanding of “what,” “how,” and “why” something is or is not working (Creswell & Clark, 2011; Klingner & Boardman, 2011). Often, it is this worldview that shapes the design of a study when the main objective is to help bridge the gap between research and practice.

Applied behavior analysis (ABA) is one of two theoretical lenses in which this study was examined. ABA is a science which focuses on the systematic observation, documentation, and assessment, of the relations between a targeted behavior and the environment. ABA methods are used in an attempt to change a person’s behavior (e.g., acquire specific skills, decrease negative behaviors, increase positive behaviors) by assessing what is prompting and maintaining the target behavior and then making adjustments to the environment to diminish the identified problem behavior. The training and education I have received using ABA practices is clearly reflected in the design of this study. That is, decisions about the individual’s target behavior, intervention goals, and phase changes in the single-subject design were made based off of objective, observational data of how the target behavior was changing in response to the intervention.

This study was also influenced through the lens of an experienced, K-12 teacher. As a public school teacher for nearly 10 years, I was introduced to a number of interventions to use with a wide variety of students with various disabilities. This experience motivated me to study the extent to which teacher “buy-in” of interventions influences the degree to which they are implemented. This teacher lens acknowledges that the most powerful of interventions, as reported by researchers, will fail to be

effective, let alone used, if not developed in a way that the teacher perceives them to be valuable and/or practical for classroom use.

### **Setting**

The study took place in one of 19 elementary schools in a Midwestern school district serving over 13,000 students. The selection of the participating school was based on convenience of proximity and the willingness of the school administration and teacher to participate. Compared to the district demographic data (69% Caucasian, 16% African-American, 8% Hispanic, and 7% Asian/Pacific Islander) the participating elementary was a culturally, racially, and economically diverse community of learners (58% Caucasian, 21% African-American, 14% Asian/Pacific Islander, 5% Native American and 2% other).

The school building was geographically located near a large university. This was representative in the large number of students who attended the elementary school whose parents were either enrolled as graduate students or were employed as either staff or faculty by the university. Based on the most current state achievement test scores (2013-2014), the school had “met” all academic indicators and was not labeled a “school in need of improvement.” During the time period in which the study took place, roughly 500 students in grades K-6 were attending the participating school.

The study was conducted in a general education math classroom including a wide range of student abilities and skill levels. Ms. Thompson followed the Everyday Mathematics curriculum, adopted by the district. On a typical day, Ms. Thompson began math class addressing the whole group to provide an overview of the day’s objectives and delivered differentiated group instructions. At this point in time, students moved to their

assigned groups (based on skill level) and either began an assigned activity (from the Everyday Mathematics curriculum) or they waited for Ms. Thompson to join their group to provide additional mathematics instruction/support. Throughout the duration of the class, Ms. Thompson moved between all of the student groups providing support and instruction as needed.

### **Participants**

The study consisted of three student participants and one teacher participant. All of the participants' names were substituted with pseudonyms. The teacher, Ms. Thompson, was asked to participate in the study on a voluntary basis. An initial meeting with the teacher was held to describe the study and explain the timeline and procedures. Ms. Thompson was informed of the role of the researcher as well as what would be expected of her and the participating students. During this initial meeting, I communicated with Ms. Thompson that at any time during the course of the study she could choose to withdraw without suffering any negative consequences. I also communicated that the information collected in the study would be kept confidential and only the primary researcher (myself) would have access to the data. At this point, the teacher verbally agreed to participate on a volunteer basis and signed a participant consent form (Appendix B).

Ms. Thompson was originally asked to nominate students with IEP behavioral goals for participation in the study. At this point, parental consent forms (Appendix C) were given to Ms. Thompson to be sent home with potential participants. These consent forms described the study and asked for parental permission of their child's participation.



However, because the students with IEP behavioral goals were not available for participation, Ms. Thompson was then asked to nominate students she felt had demonstrated off-task or non-compliant behavior throughout the school year and who may benefit from a self-monitoring intervention. Ms. Thompson communicated that she had several students with documented attention disorders who were not currently receiving the support they needed to be successful in the classroom, a circumstance which aligns with findings in the EBD literature (i.e., the majority of students with, or at risk of an EBD are receiving all of their education and school experience in the general education classroom; Forness, Kim, & Walker, 2012).

Ms. Thompson identified four additional students for participation, consent forms were sent home with the students and three of the four forms were signed and returned. Upon receipt of the signed forms, I met individually with the consented students to describe the study and ask for their participation on a volunteer basis. As with the participating teacher, the students were informed that they are able to withdraw from the study at any time without repercussions. It was also communicated with the students that all data related to the study, including their names, would be kept confidential. All three students verbally agreed to participate as a study volunteer and signed a student assent form (Appendix D).

### **Teacher**

Ms. Thompson was entering her 13th year of teaching. She had earned a bachelor's degree in elementary education with a reading endorsement and held a valid state teaching license. Ms. Thompson had also earned a master's degree in quality

schools (the program's curriculum was based on William Glasser's Choice Theory and was formerly offered at a local university) at the time of the study had earned 36 additional graduate hours past her masters. She spent her first 10 years teaching 6th grade at a middle school, followed by 2 years in a 5th/6th combined classroom in an elementary school, and was spending her 13th year (during the study) in a straight grade 5 classroom. She reported not having any formal training in working with or teaching students with special needs, including students with EBD. Ms. Thompson did convey a high level of familiarity and comfort with using technology devices in her classroom and indicated an interest in learning more about implementing technology-based interventions for her students.

### **Students**

Inclusion criteria for student participation in this study consisted of: (a) teacher nomination of students who frequently displayed off-task or non-compliant behavior, (b) students who scored as "at risk" for hyperactivity/inattention or conduct problems as measured by the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997), and (c) students who demonstrated low levels of academic engagement (AE) or high levels of disruptive behavior as measured through direct observation of student behavior. These inclusion criteria were selected based on previous literature indicating students with off-task, non-compliant, hyperactive, inattentive, or disruptive behavior may benefit from self-monitoring interventions (Briesch & Chafouleas, 2009; Carter et al., 2011; Harris et al., 2005).

The SDQ (Appendix E) was used to confirm evidence of “at-risk” or abnormal levels of inattention in the classroom. The SDQ is a brief behavioral screening questionnaire for students ages 3-17 years. It exists in several versions to meet the various needs of researchers, clinicians, and educationalists, however for the most part, the SDQ consists of 25 items divided between five scales. For the purposes of this study, the teacher version of the SDQ for students ages 11-17 was completed by Ms. Thompson prior to implementation of the intervention. As previously stated, students were eligible if they scored in the “at risk” range for hyperactivity/inattention or conduct problems. SDQ items associated with hyperactivity/inattention were: (a) restless, overactive, cannot stay still for long, (b) constantly fidgeting or squirming, (c) easily distracted, concentration wanders, (d) thinks things out before acting, (e) sees tasks through to the end. Items associated with conduct were: (a) often has temper tantrums or hot tempers, (b) generally obedient, (c) often fights with other children, (d) often lies or cheats, (e) steals from home, school or elsewhere. All three consented students scored either in the “at risk” range for hyperactivity/inattention therefore were considered to be suitable candidates for participation (Briesch & Chafouleas, 2009; Carter et al., 2011; Harris et al., 2005). See the section, Data Collection, to obtain a detailed description of the SDQ.

**John.** John was an 11-yr old, White, male who was nominated by his teacher to participate in the study for being frequently off-task and disengaged during class time. As reported by his teacher, John was rarely (if ever) disruptive to others. Ms. Thompson’s primary concern was his lack of academic engagement in the classroom. During the time of the study, John had a 504 plan to provide accommodations for attention deficit,

however his teacher reported that he had not been medically diagnosed for ADHD and to her knowledge he was not taking any medications. The scores from the teacher completed extended version of the SDQ indicated that he was at “very high risk” for “hyperactivity and concentration difficulties.” His composite scores for all categories of the SDQ placed him at “medium risk” for “any disorder.”

As reported by Ms. Thompson, John scored above average on the math portion of the Iowa Assessments and demonstrated above grade level work in mathematics in her classroom. In all data collection sessions, John was included in an extended learning math group, comprised of 3-4 students in his class, who worked together on mathematical problems and projects that focused on the application of mathematical concepts and skills. After Ms. Thompson would start the class with a brief whole group session, leveled groups of students would break-out into various areas of the classroom to work cooperatively on assigned tasks.

*Ashley.* Ashley was an 11 yr old, Middle Eastern, female who was also nominated for participation in the study for frequently displaying off-task behavior in class. Just as with John, the teacher communicated that Ashley was never disruptive. Ms. Thompson also emphasized that Ashley was extremely quiet and shy. Ashley had been diagnosed with ADHD and during the time of the study was taking medication for this diagnoses. Ashley was not receiving any special education services or accommodations under IDEA or Section 504. The teacher scores on the extended version of the SDQ indicated that Ashley was at “very high risk” for “hyperactivity and concentration difficulties.” Her

combined scores indicated that she was at “medium risk” for “any disorder.” As reported by

Ms. Thompson reported Ashley scored in the average range on the Iowa Assessments and demonstrated average to below average work in mathematics in her classroom. Throughout the data collection sessions, Ashley was often included in a group of students who were provided additional instruction and practice by Ms. Thompson. Following this instruction, Ashley group was often assigned independent practice on a specific skill (in the form of a worksheet) or they were provided group project instructions. Again, Ashley participated in group work, in the classroom, following Ms. Thompson’s brief whole group session at the beginning of each class period.

*Emily.* Emily was an 11 yr old, Middle Eastern, female who had also been teacher nominated for participation due to frequent displays of off-task behavior. The teacher reported that Emily was not a distraction to other students and that the primary goal for Emily was to increase the amount of time she was academically engaged during class. At the time of the study, Emily’s parents were in the process of getting her tested for an attention disorder. She was not receiving special education services nor were any accommodations under IDEA or Section 504 being provided. To Ms. Thompson’s knowledge, she was not taking any medications. The teacher scores from the extended version of the SDQ indicated that Emily was at “slightly raised” risk for “hyperactivity and concentration difficulties.” The combined scores from all categories indicated that she was at “medium risk” for “any disorder.”

Similar to Ashley, Ms. Thompson communicated that Emily scored in the average range on the Iowa Assessments. She also reported that Emily demonstrated average to below average classroom work in math. Ashley and Emily were almost always included in the same math group that met after a whole group session. In this group they were provided additional instruction/support from Ms. Thompson followed by either independent practice of a mathematical skill or a group project.

### **Data Collection**

This section of Chapter 3 provides an outline and description of the independent and dependent variables, the quantitative and qualitative measures and procedures, and a summary of the how the data was analyzed. The instruments used to collect data in this study included: (a) direct observation of student behavior, (b) The Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997), (c) The Intervention Rating Profile (IRP-15; Witt & Elliott, 1985), (d) semi-structured interviews, and (e) email journals and.

### **Dependent Variable: Academic Engagement (AE)**

*Academic engagement* (AE) was the dependent measure of this study. It was defined as, “The student attending to assigned tasks and following classroom rules and expectations as directed by the teacher.” Examples of AE included: following teacher instructions and directions, working on the assigned task as expected, using materials appropriately, asking for teacher assistance as needed, interacting with adults and peers in a respectful manner, staying focused on the academic content/topic (Bruhn et al., in press; Bruhn & Watt, 2012). Non-examples of AE included: wandering eyes, moving around

the classroom without purpose or permission, engaging in tasks other than the one assigned (Bruhn, et al., in press; Bruhn & Watt 2012).

Whole-interval recording was used to collect AE data. Whole interval recording requires that the behavior consume the entire interval before it can be documented as being present. Whole interval recording tends to underestimate the duration of the response, therefore it is desirable to use when you are seeking to increase a behavior (i.e., academic engagement; Alberto & Troutman, 2012).

Depending on the day's schedule, each class period ranged from 45-60 minutes. Because the participants were in the same classroom, intervals were alternated sequentially such that John was observed for 20-sec, then Ashley, then Emily (Cooper, Heron, & Heward, 2007), resulting in each student observed between 15-18-min each session. Data collection occurred every day for 5 weeks. AE was calculated by dividing the number of intervals the student was documented as "academically engaged" by the total number of intervals data was recorded for that session, and multiplying by 100. Data were then graphed based on percent AE for an entire class period (i.e., session).

### **Reliability of measurement**

Further, to ensure reliability of the dependent variable, interobserver agreement (IOA) data were collected. IOA consists of two or more individuals using the same behavior definitions, data collection system, and recording procedures to observe and record events, simultaneously but independently. In this study, two graduate students, earning a PhD in special education, assisted with the IOA process. Prior to collecting data on the dependent variable (AE), the graduate students were trained to reliability on the

recording system (whole interval recording; Appendix F). Training consisted of approximately one hour of instruction on data collection procedures and another hour in the classroom observing and recording student behavior (AE) using the exact same procedures that were then used during all phases of the study.

Point-by-point IOA was used to calculate the percent agreement between observers. This method is most suitable for interval recording methods because each interval or point can be compared and a percentage can be derived (Cooper, Heron, & Heward, 2007). Point-by-point IOA is calculated by dividing the number of agreements by the number of disagreements plus the number of agreements with the quotient multiplied by 100 (Cooper, Heron, & Heward, 2007) Ninety-percent IOA is a widely accepted percent to obtain on simple behaviors (Cooper, Heron, & Heward, 2007). For this study, during IOA training, a minimum of 96% reliability was obtained, with both volunteer graduate students, on three consecutive 15 minute sessions in the classroom. During the study, IOA data were collected in at least 25% of all sessions across all phases for all three participants. IOA for John calculated to 98.94%, for Ashley 98.24%, and for Emily 98.33%.

### **Strengths and Difficulties Questionnaire**

The SDQ is a validated measure used to identify specific problem behaviors (i.e., ADHD/inattention, noncompliance). As previously noted, the SDQ is a no-cost, brief behavioral screening questionnaire validated for persons ages 3 to 17 years. It assesses five main behavior domains: (1) conduct problems, (2) hyperactivity/inattention, (3) peer



problems, (4) emotional symptoms, and (5) prosocial behavior. These five domains are combined into an overall total difficulties score.

Because previous literature has determined behavioral characteristics related to ADHD and inattention are most responsive to self-monitoring interventions (Briesch & Chafouleas, 2009; Carter et al., 2011; Harris et al., 2005), the teacher score matching the ADHD/inattention category on the SDQ was of particular interest when identifying student participants for this study.

In terms of the trustworthiness of the SDQ measure, extensive research has been conducted to establish the reliability and validity of the parent, teacher, and youth self-report versions of the SDQ. The reliability of the teacher version has demonstrated high internal consistency with Cronbach's alpha coefficients of .87 (total difficulties), .74 (Conduct Problems), and .88 (Hyperactivity/Inattention; Lane, Menzies, Oakes, & Kalberg, 2013). Furthermore, studies have been conducted with parents, teachers and children (across all age levels) examining the convergent validity of the SDQ and other validated behavioral tests such as the Rutter questionnaire and the Child Behavior Checklist (CBCL). The SDQ is highly correlated with the Rutter ( $r = .92$  for teacher report and  $.88$  for parent report; Goodman, 1997) and the CBCL ( $r = .87$ ; Goodman & Scott, 1999).

Again, for the purpose of this study, the extended, two-sided version of the SDQ was used prior to intervention. This version was developed to help inform intervention efforts by including additional items aimed to produce more information regarding levels of anxiety, chronicity of the problem behavior, social implications, and the general

impact the behavior is having on others. Information obtained from this questionnaire, was cross-checked with the teacher interview data to determine if the problem behaviors (i.e., inattention) identified in the teacher interview were also identified on the questionnaire.

Upon completion of the intervention, the follow-up version of the SDQ was completed by the teacher. This version of the SDQ contains two additional questions, and is designed to help evaluate intervention outcomes. The two additional questions are as follows: within the last month, “Has the intervention reduced problems?” and “Has the intervention helped in other ways such as making the problem more tolerable or bearable?” These open-ended questions were used as part of the qualitative strand of data to evaluate teacher perceptions of the intervention.

### **Intervention Rating Profile**

The *Intervention Rating Profile-15* (IRP-15; Witt & Elliott, 1985) is a 15 item questionnaire using a 6 point Likert-type scale to quantitatively assess the social validity of an intervention (Appendix H). Total scores can range from 15-90 with high scores reflecting high levels of acceptability/social validity of an intervention. More specifically the 15 items on this questionnaire assess such factors as whether an intervention is appropriate for a given student/situation, whether or not it requires too much time for implementation, whether it distracts or negatively impacts other students, and whether it poses unnecessary risks for students (Witt & Martens, 1983).

With regards to the internal validity of the IRP-15, Freer and Watson (1999) conducted a study where they asked 61 teachers and 111 parents to rate the acceptability

of three types of consultation services (parent-only behavioral consultation, teacher-only behavioral consultation, and conjoint behavioral consultation) delivered through the school system. The authors reported an internal consistency coefficient of .96 (between the parent and teacher ratings), determining that findings indicated the IRP-15 to be both valid and reliable for measuring the social validity of an intervention.

For this study, an adapted version of the IRP-15 (Bruhn et al., in press), consisting of three additional open-ended questions at the end of the survey, was created to further understand the teacher's perceptions of *SCORE IT* (Appendix H). This adapted version of the IRP-15 was the same survey that was used to assess the social validity of the READ 180, *SCORE IT* studies. In this study, after all direct observation data had been collected on all three student participants, the teacher independently completed the adapted version of the IRP-15. Waiting until the conclusion of the study to have the teacher complete the survey maximized the amount of time she was able to spend with and experience the intervention before assessing the social validity. During the analysis process of the study, the quantitative data from this questionnaire was converged with the qualitative data from the interviews and the email journals to better assess teacher perceptions of the intervention. Additional information regarding this process can be found under the *Data Analysis* section of this chapter.

### **Interviews**

Teacher interviews, pre and post intervention, were used to provide an accurate interpretation of the teacher perceptions of the intervention. Interviewing is a commonly used practice in qualitative research (DiCicco-Bloom & Crabtree, 2006; Merriam, 2009).

This research technique is often deemed an essential strategy to employ when attempting to interpret a person's feelings, thoughts or behaviors (Merriam, 2009). During an interview, a participant is provided an opportunity to recount their experiences, feelings and thoughts providing a richer and more comprehensive illustration than what can be communicated in a survey or questionnaire (Lapan, Quartaroli, & Riemer, 2011).

The protocol used for the interviews in this study was based on a combination of Merriam's (2009) and Whiting's (2008) suggestions for conducting semi-structured interviews. A semi-structured interview is one in which all the questions are flexibly worded and are merely used as a guide for the interview; neither the exact wording nor the order of the questions are predetermined (Merriam, 2009). The format of the semi-structured interview allows the researcher to respond to the emerging perspectives, thoughts, and feelings of the participant (Merriam, 2009).

In this study, open-ended questions were used to gain detailed and complete, responses from the teacher. By recommendation from Whiting (2008) a conscience effort was made to refrain from posing: (a) yes/no questions, (b) multiple questions at once, or (c) leading questions. Appendix I provides an outline of the semi-structured interview guide used for this study. The interview guide was comprised of 3 sets of questions: (a) main questions, (b) additional questions, and (c) clarifying questions. I used these sets of questions to keep me focused on the purpose of the interview (teacher perceptions of the intervention), however I was flexible with the flow of the interview and encouraged the participant to add or share any thoughts that came to mind. The semi-structured interview

allowed me to maintain a necessary level of organization and control over the interview while providing the flexibility to explore any new ideas that emerged (Merriam, 2009).

Both pre and post interviews were done in person and each time the participating teacher granted me permission to record the interview using a recording app on a Chromebook acer (IRB approval for recording of the interviews, see Appendix A). Post-interview reflections were written immediately following both interviews. The reflections contained descriptive notes including observations of teacher body-language, tone, and expression.

Within 24 hours from when the interviews were conducted, the interviews were transcribed. The transcriptions were made using a widely accepted transcription protocol (Merriam, 2009; Appendix J) including: (a) identifying information at the top of the page (when, where, who), (b) line numbering down the left-hand side of the page, (c) interview questions bolded, and (d) a wide margin on the right-hand side of the page for additional notes or codes. After transcribing the interviews, a copy of the transcription was shared with the teacher to review for accuracy. The teacher was encouraged to add or change any information in the transcription as she deemed necessary.

### **Email Journals**

Throughout the course of the study, Ms. Thompson completed four email journals, averaging one hundred and eleven words per journal entry. According to Merriam (2009) “personal documents are a reliable source of data concerning a person’s attitudes, beliefs and view of the world” (p. 143). Once a week (each Wednesday during the course of the study) the teacher was sent an email journal prompt (Appendix K). Even

though I never gave Ms. Thompson a timeline to respond to the prompts, she completed each of the entries within 24 hours. All of the prompts consisted of 1-2 questions, and were designed to gather as much information about Ms. Thompson's experience with *SCORE IT* as well as her experience with and thoughts about related factors (i.e., comfort level with technology, experience with self-monitoring interventions, expectations of student outcomes, and difficulties with *SCORE IT*) that could impact her overall perceptions of the intervention.

The first email prompt attempted to understand how Ms. Thompson was approaching the intervention by gauging her experience and comfort level with using technology and self-monitoring interventions in her classroom. The second email journal was designed to further understand what expectations Ms. Thompson had regarding student outcomes. If expectations were high and only small changes in behavior were made (or vice a versa) this could impact how Ms. Thompson perceives the value of the intervention. The third email journal asked Ms. Thompson to tell a story about using the app. The goal of this prompt was to get her to think deeply about how the app was working for her and her students. The final journal prompt asked Ms. Thompson to reflect on her experience using *SCORE IT* and to offer suggestions for future use.

Information regarding how the email journals were analyzed, coded, and incorporated in the results of this study can be found under the section titled Data Analysis of this chapter.

### **Independent Variable: *SCORE IT***

The iPad app, *SCORE IT*, developed by Bruhn, Goin, & Hasselbring (2014) is a self-monitoring intervention originally designed to be used by teachers and students in a *READ 180* classroom to monitor and evaluate student adherence to classroom expectations (e.g., Be Respectful, Be Responsible, Be Ready). *READ 180* is an evidence based reading curriculum, developed by Scholastic, to provide rigorous instruction, targeting specific skill deficits for students performing below grade level in reading.

The *SCORE IT* intervention was specifically programmed to follow the instructional rotations (5 rotations during each class period) of the *READ 180* curriculum. These rotations consisted of: (1) whole group instruction (20 min), (2) independent reading (20 min), (3) computer software (20 min), (4) small group instruction (20 min), and (5) whole group wrap-up (10 min).

Using the *SCORE IT* intervention, at the conclusion of each of the 5 instructional rotations, both teacher and student(s) were to evaluate and score student behavior based on the extent to which the student had met the previously established classroom expectations. The teacher and student(s) used a 5-point ordered response scale to score their behavior with 0 representing not having met the expectation at all, and 4 having fully met the expectation. The icons and language programmed into the app were specific to the daily routine of the *READ 180* curriculum, thus limiting the app to a specific content area and further restricting it to a specific curriculum. See Figure 1 for screenshots of the original *SCORE IT* intervention.

Figure 1

Screenshots of *READ 180 SCORE IT*.



For this study, *SCORE IT* was reprogrammed by one of the original app developers, Laura Goin (2013). The goal of reprogramming the app was to create an intervention that could be generalized into other settings beyond the *READ 180*



classroom. More specifically, additional options were added to the settings of *SCORE IT* to allow for the intervention to be customized and implemented across content areas. This was accomplished by providing users with the option of using lettered intervals (i.e., A, B, C, D, E) based on a timer rather than the READ 180 rotations (i.e., whole group, independent reading, computer software, small group instruction, whole group wrap-up). Additionally, the reprogrammed app allowed the teacher or researcher to set and adjust the duration of each lettered interval in accordance to the individual needs of the student. See Figure 2 for screenshots of the reprogrammed app.

Figure 2

*Screenshot of reprogrammed app, SCORE IT.*



In this study, the lettered intervals were programmed for 10 min. The duration of the intervals was primarily determined by the participating teacher. I requested that Ms. Thompson base this decision on: (a) how often she thought the students needed to be reminded to think about their behavior, (b) the least distracting for all students in the class, and (c) the most manageable for her.

Prior to implementing the *SCORE IT* intervention, the teacher was also asked if she preferred each of the participating students to have their own iPad for the students to self-record their behavior, or if she would like the students to share an iPad and take-turns self-recording behavior after each 10-min interval. At this particular moment in the study, Ms. Thompson communicated that she preferred the students to share one iPad and for them to take-turns self-recording their behavior within the app. In addition, she expressed a desire for the iPad to sit on her desk, in the front, left corner of the classroom. She felt this location was easily accessible for her and for all three participating students.

In an effort to maintain consistency with previously established classroom rules and expectations, the teacher was also asked to identify and provide definitions for three classroom expectations to be programmed into the app. Ms. Thompson chose the following expectations and corresponding definitions: (a) *Be Respectful* - Did I listen to others, follow directions, and ask for help if needed? (b) *Be Responsible* - Did I work carefully on my assigned tasks and not distract my peers? and (c) *Be Ready* - Did I have all of my materials and begin my assigned tasks immediately? As illustrated in Figure 2, a 5-pt ordered response scale was paired with each of these expectations.

Upon audio cue (3 small beeps) which occurred every 10-min during class, the students moved to the iPad, clicked on the *SCORE IT* icon, took turns choosing their name (programmed into the app prior to intervention), and rating their behavior (0 = never, 1 = a little, 2 = sometimes, 3 = a lot, and 4 = always) to communicate the degree to which he/she felt they had met each of the expectations. Following the student completing his/her rating for a particular interval, the teacher would go to the iPad, click

on the “teacher” icon within the *SCORE IT* app, and input a score (using the same scale as the students) that she felt accurately represented the extent to which each of the students had met each of the behavioral expectations.

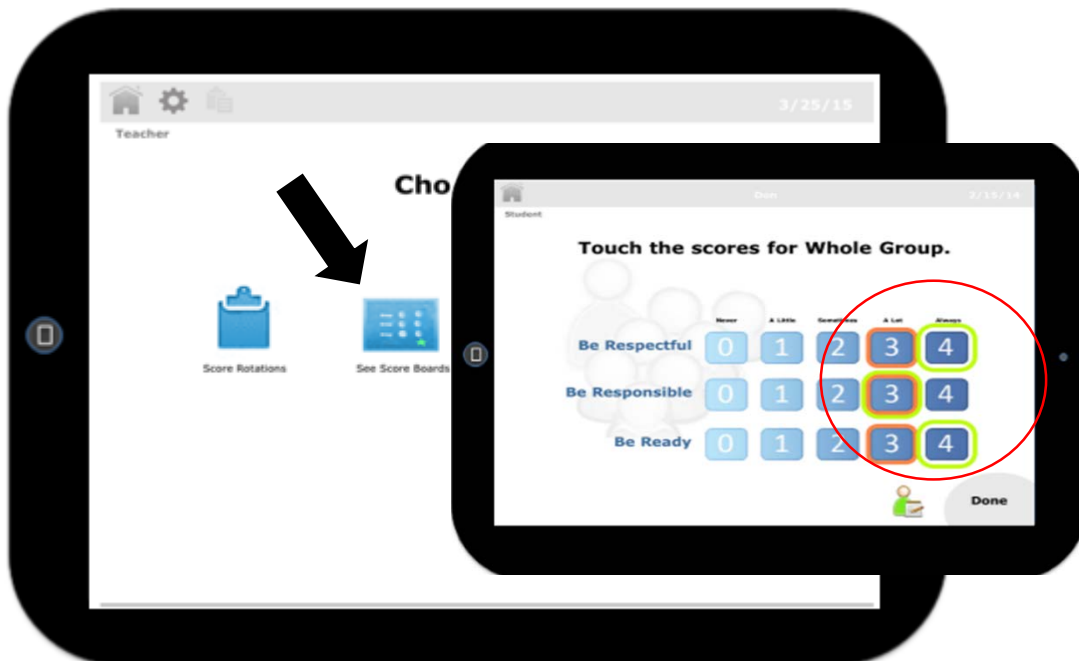
Shortly after the first intervention phase of the study was underway, Ms. Thompson communicated she was not satisfied with the process that had been established to record student behavior data. She felt the movement to and from the iPad to input the behavior scores was distracting to everyone in the classroom. The process was altered to eliminate the students having to leave their work area, decreasing distractions for their peers and for themselves. The new procedure involved the teacher walking the iPad to each of the students upon the completion of each 10-min interval. For example, after the app timer sounded, Ms. Thompson, while continuing with instruction, would take the iPad from her desk and walk the device to each of the students, one student at a time, to input their behavior scores within the app.

The *SCORE IT* app was originally programmed to automatically differentiate and compare student and teacher behavior ratings (See figure 3). In previous *SCORE IT* studies, this feature provided an opportunity for the teacher and student to engage in a brief discussion about the student’s behavior, allowing the teacher to provide specific feedback (e.g., I gave you a 4 for the expectation *Be Ready* because you came to math with all of your materials). Because one of the goals of this study was to examine the impact *SCORE IT* had on behavior without the variable of reinforcement and with limited teacher feedback, I instructed the teacher to not discuss the likeness or difference between the teacher and student scores. I welcomed her to tap on this icon and view the variations

between the scores, however I asked her to not engage in a conversation with the students about the scores that had been recorded within the app. However, at the end of each class period, the students would view their PPB within *SCORE IT*, observing if they had met their goal. At this time, the teacher would often ask each of the students if they had met their goal for the day.

Figure 3

*SCORE IT Scoreboard icon.*



Based on the direct observation of student behavior data during baseline, along with teacher input, a percentage of positive behavior (PPB) goal was programmed into the app (see Figure 4). This percent represented the degree to which the student was meeting the expectations programmed into the app. The PPB score was derived using the teacher ratings of student behavior. Specifically, this calculation was obtained by taking the total points earned for the day, divided by the total points possible, and multiplying

by 100 (e.g., if the student earned 3 out of 4 points, for all three classroom expectations, for 5 intervals, they would earn 45 out of a possible 60 points to equal 75% PPB).

*SCORE IT* was programmed to automatically calculate and graph the PPB after each time the teacher recorded his/her behavior scores and provided a total PPB for the end of each class period.

Prior to the implementation of intervention, I explained the definition of PPB with each of the participants and communicated that the PBB goal was set at 70%. The 70% PPB goal line was negotiated between the teacher and myself prior to training the students on intervention. The teacher indicated that based her observation of the student participants' behavior throughout the school year, she was confident all participating students were capable of achieving a 70% PPB goal. I trained each of the participants how to view their PPB graph to determine if they had met their goal for the day. Furthermore, *SCORE IT* has been programmed to store and display up to five days of student PPB data on the screen at one time. This feature allowed the participants to see whether they were meeting their daily goal for PPB and see progress over time.

Figure 4

*SCORE IT* graph icon/feature



### **Pre-Intervention Training**

Prior to implementing *SCORE IT*, a training session was held with the participating students and the teacher. During this meeting, the operational definitions of the previously established and programmed classroom expectations (*Be Respectful, Be Ready, Be Responsible*) were reviewed and examples and nonexamples were communicated and modeled. Next, a thorough “tour” of *SCORE IT* was administered and opportunities for participants to practice using the app and to ask questions was provided. Once the participants indicated they felt comfortable and confident with the intervention, the training session ended and the students were told they would begin using the app the following school day.

## **Treatment Fidelity**

To determine if the intervention was implemented with fidelity, a procedural checklist was created (Appendix G). The procedural checklist was used to record the extent to which teachers and students adhered to all intervention procedures. The intervention procedures that were monitored included: (a) Did the student rate him/herself using the SM App at the end of each 10-min interval? (b), Did the teacher rate the target student using the SM app at the end of each 10-min interval? (c) At the end of each class period, did the student review his/her PPB goal?

To provide a quantitative measure of fidelity, 1 point was awarded for completion of each of the intervention procedures. The total number of points possible varied depending on the number of intervals the participants completed in a class period. The formula that was used to calculate the extent to which participants followed the procedures was as follows: total points earned, divided by maximum number of possible points, multiplied by 100 (e.g., if 8 points were earned out of a possible 9 points (completion of 4 intervals) \* 100 = 89% of the time the student and teacher participants completed all components of the intervention with fidelity). I recorded and calculated, by hand, treatment fidelity for each participant, for every intervention observation session. Appendix G provides an example of the fidelity checklist as well as a visual explanation of how the fidelity of implementation percentage was calculated.

## **Data Analysis**

The data analysis section of this chapter is split into two sections: *Research Question 1* and *Research Question 2*. The first question aims to determine the extent to



which a functional relation exists between *SCORE IT* and the academic engagement of the three student participants. This question is answered via traditional data collection procedures and analysis of a single-subject, withdrawal research design. The second question of the study asks a very different question requiring the use of both quantitative and qualitative research methods. A mixed methods analysis of data was employed to draw conclusions regarding how the teacher perceives the value and feasibility of the intervention.

### **Research Question 1**

The traditional approach to analysis of single-subject research involves “systematic visual comparison of responding within and across conditions of a study” (Horner et al., 2005). This visual analysis includes the interpretation of the *level*, *trend*, and *stability* of the performance data (DV) in all phases (ABAB) of the study. The *level* refers to the mean performance during a single phase of a study. The *trend* is the rate of increase or decrease of the dependent variable (i.e., the slope) during each phase. *Stability* represents the extent to which the performance data (e.g., academic engagement) varies within a phase.

Horner et al., (2005) also described 4 additional factors to inspect when analyzing single-subject data: (a) the immediacy of the effects upon implementation or withdrawal of the intervention, (b) the proportion of data points in neighboring phases that overlap in level, (c) the intensity of change in the independent variable, and (d) the likeness or difference between data patterns across all phases of the study.

In this study, the comparison of academic engagement data across baseline and intervention phases was used to determine if a functional relation existed between the intervention (IV) and the behavior (DV). That is, a functional relation between the IV and DV was documented if there was: (a) a timely demonstration of a change to the DV upon implementation of the intervention, (b) a significant change in the level and/or trend of the DV between phases, and (c) a predictable pattern of behavior change was established after the initial baseline and intervention phases. The visual analysis of the level, trend, and stability of graphed data not only serves as an overall analysis of the impact that the intervention has on performance (summative assessment) it also serves as a basis for phase changes (formative assessment). Conditions in this study included baseline (A1), intervention (B1), withdrawal (A2), and reinstatement of intervention (B2) and are described below.

### **Baseline (A1)**

According to Kazdin (2011) the baseline phase serves two critical functions: (a) the “descriptive function” which describes the existing level of performance or the extent to which the student is engaging in the problem behavior under “business as usual” conditions, and (b) the “predictive function” which serves as the basis for predicting the level at which the student will continue to perform the target behavior without implementation of intervention.

For this study, baseline conditions consisted of typical classroom procedures during the participants’ math class. The inclusive classroom consisted of 21, grade 5 students, representing a full range of academic, social, and behavioral abilities. The

students sat in pods of 5-6 desks, assigned by the teacher, based on the students' ability to "work well together" (Ms. Thompson, March 3, 2015). Most often, the teacher began each class with a whole group discussion outlining the objectives for the class and providing instructions and expectations for her differentiated math groups. Ms. Thompson explained that these differentiated groups were flexible and were formed based on a short assessment (provided in the Everyday Math curriculum) prior to the beginning of each unit. After receiving the day's instructions, students rearranged themselves throughout the classroom based on their groups' assigned tasks and instructions.

In terms of having or following a specific classroom/school behavioral plan, Ms. Thompson reported they were a Positive Behavior Interventions and Supports (PBIS) school and displayed PBIS posters in their bathrooms, cafeteria and hallways. However, she also stated she didn't know if the school had identified any school-wide social/behavioral expectations, an essential component of a PBIS school community. Ms. Thompson communicated that she had created her own classroom expectations and procedures (i.e., raise your hands to talk, use the bathroom pass, be respectful to others, be honest) and highlighted that she displayed these rules and procedures on posters in her classroom. She also communicated that she taught her classroom rules/procedures at the beginning of each academic year and reviewed them as needed.

### **Intervention (B1)**

The intervention condition paralleled baseline condition in terms of math instruction, classroom procedures, and students in the classroom. The only difference

between this first phase intervention and baseline was the introduction of the intervention, *SCORE IT*. Just as in baseline, behavior data was collected and analyzed and once a participant evidenced a therapeutic change in behavior for at least three successive sessions, the intervention was withdrawn (see next phase).

### **Withdrawal (A2)**

The return to baseline condition: (a) describes current behavior performance, (b) allows for a second prediction of what behavior would look like in the future without intervention, and (c) serves as a test of the original prediction in the first phase of baseline. If levels of behavior return to comparable levels as seen in the first phase of the study, we can begin to hypothesize the intervention is impacting behavior in a positive way.

During return to baseline, *SCORE IT* was removed from the students' classroom routine. Neither the students nor teacher used the app during this phase. Upon AE stabilizing at low levels or moving in a counter therapeutic direction, intervention was reintroduced (see next phase).

### **Return to intervention (B2)**

In the final phase, intervention was reinstated. This phase serves the same purpose as the previous phase, namely to describe performance, and to test whether behavior responds in a similar fashion to the intervention as it did in the previous intervention phase. It is at this point, if response to intervention mimics that of the first intervention phase, we can attribute the demonstrated changes in behavior to the intervention and rule out contributions of external variables.

During this final phase, data collection and analysis procedures continued as they had in the previous phases of the study. I visually analyzed the graphed data, looking for similar levels of AE as what was demonstrated in the first intervention phase. Once high levels of AE had stabilized or were moving in a therapeutic trend, I ceased collecting direct observation of behavior data.

It is important to note that the students began the study on different dates depending on how quickly their parental consent forms were signed and returned to school. In addition, the students moved through the four phases of the study at varying rates dependent on their graphed data (i.e., the degree to which the behavior was or was not responding to intervention).

## **Research Question 2**

The second question of this study attempted to explore how the teacher viewed the feasibility and value of the intervention, *SCORE IT*. The nature of this question was complex in that it sought to translate the meaning of a naturally occurring phenomenon. In an attempt to provide an exhaustive analysis and bring meaning and understanding to how the teacher perceived the value and feasibility of the intervention, both qualitative and quantitative data were collected, merged, and analyzed.

Quantitative and qualitative researchers go through similar steps to analyze the data: preparing the data for analysis, exploring the data, analyzing the data, representing the analysis, interpreting the analysis, and validating the data and interpretation (Creswell & Clark, 2011). Whereas in quantitative research these steps tend to present themselves in a linear form, in qualitative work they are often completed simultaneously and

repeated throughout the duration of the study appearing to be sporadic in fashion (Creswell & Clark, 2011). In this section, I provide a description of how both the quantitative and qualitative data, in relation to the second question of the study, were analyzed and merged. The data analysis process used to answer the second research question was based on recommendations from Creswell & Clark, (2011). The remainder of this section provides an outline and explanation of each step in the analysis process.

### **Preparing the data for analysis**

The interview data, email journals, and the visual analysis of the quantitative data took place simultaneously throughout the study. Appendix L provides an outline of the sequence in which data was collected and prepared. Because multiple sources of data were being collected simultaneously throughout the study, labeled electronic folders, as well as labeled desk drawer folders, were created to keep the data organized and secure. Both electronic and paper copies of the data were used to transcribe and analyze the data. For security purposes, all data was coded and excluded any personal identifiers. Paper copies of data were stored in a locked office, while all electronic data was stored on a passcode protected computer.

### **Exploring the data**

The purpose of this step in the analysis process was to form broad categories of information (codes and themes). For this study, all data were read in entirety to develop a general understanding and overview. This involved recording thoughts and ideas in the form of memos in the margins of the transcript. At this point, a qualitative codebook was developed. This codebook relied on codes from past literature (Lyst, Gabriel,

O'Shaughnessy, Meyers, & Meyers, 2005; Scruggs, Mastropieri, & McDuffie, 2007) as well as codes that emerged during the analysis process. The primary purpose of the codebook for this study, was to help organize and simplify all of the data. The coding process was flexible in that as new codes were added, other codes were sometimes removed.

### **Analyzing the data**

This step of the analysis process involved finalizing themes and making connections. The transcription and notes were divided into small units (phrases, sentences, or paragraphs), labels were assigned to each unit, and then groupings between codes and themes were made. A visual theme map was created to represent the connections made between various groups of data. Appendix M provides an illustration of one of the working maps used to help make connections between groups of data. It was during this step of the analysis process that the qualitative data was merged with the quantitative data and connections between these two strands were made.

A peer review process was used to check for accuracy of theme development. A PhD graduate student who had experience with qualitative research cross checked the qualitative analysis procedures: exploring the data, analyzing the data, representing the data, and interpreting the results. In addition, during this peer review process, the accuracy of the codes and themes that were drawn from the data was analyzed. Further detail on the reliability and validity of the data can be found in this chapter under the section titled, *Trustworthiness*.

### **Representing the data**

The next step of the analysis process was meant to provide evidence for the themes that emerged from the data. For this study, a discussion of the evidence is provided (Chapter 4) to defend the identified themes. This was achieved by: citing specific quotes from the interviews and email journals, including a diagram of the theme analysis process (Appendix M), providing an explanation of the peer review process (Appendix N) and using different sources of data to cite multiple items of evidence (Merriam, 2009; Creswell & Clark, 2011).

### **Interpreting the results**

An interpretation of the meaning of the results was the final step of the analysis process (Chapter 5). In Chapter 5, a description of how the research questions were answered can be found and comparisons from this study are made to findings from related literature (Lyst, et al., 2005; Schwartz & Baer, 1991). It is also during the process of interpreting the data that limitations of this study were explored and suggestions for future research were considered.

### **Trustworthiness**

Taking measures to validate the data, the results, and the interpretation of a study is a necessary component of all good research (Creswell & Clark, 2011; Merriam, 2009; Kazdin, 2011). Validity, in both qualitative and quantitative research, “serves the purpose of checking on the quality” of the study (Creswell & Clark, 2011; p. 210). In this study, several procedures were taken to obtain valid data, results, and interpretations. The next section of this Chapter outlines and explains each of these procedures.



## **Triangulation**

Triangulation has been widely accepted as a credible technique to validate data through cross verification from two or more of the following: (a) methods, (b) sources, (c) investigators, or (d) theories (Mathison, 1988; Merriam, 2009). Triangulation is simply a strategy that is used to increase the validity of research findings (Mathison, 1988).

In this study, I triangulated codes and themes that emerged from the interviews, email journals, and both qualitative and quantitative data obtained from the IRP-15 questionnaire. I specifically looked to see if the qualitative data concerning the value or use of the intervention supported or opposed how the teacher quantitatively evaluated the intervention on the IRP-15 questionnaire. This helped me to determine if the teacher was reliable in how she communicated her perceptions of the intervention.

## **Member Checks**

Another method used to gain validity is the use of *member checks* (Brantlinger et al., 2005; McDuffie & Scruggs, 2008; Merriam, 2009). The process of member checks involves asking your participants to review and confirm the accuracy of your transcripts, field notes, results, or interpretations (Brantlinger et al., 2005). This is a commonly used and accepted process to validate data, results, and interpretations of a qualitative study (Merriam, 2009). In fact, Maxwell (2005) claimed that member checking is “the single most important way of ruling out the possibility of misinterpreting the meaning of what participants say and do and the perspective they have on what is going on, as well as

being an important way to identifying any biases and misunderstanding of what you observed” (p. 111).

Three member checks took place throughout the course of this study. The first occurred after I had transcribed the first interview. The second member check took place near the end of the study following my transcription and interpretation of the fifth, and final, email journal. The final member check took place following the post-intervention interview. Each time I provided the teacher with my interpretations of the data and asked that she offer any corrections or identify any gaps or oversights.

For all three member checks, the teacher provided additional thoughts and explanations of her feelings toward the intervention at the bottom of each of the interpretations that were shared with her. These additional thoughts and explanations were then coded and integrated into the overall theme development process. The teacher never indicated that she was in disagreement with or provided corrections for any of the codes, themes, or interpretations of the data.

### **Peer Review**

Peer review is another method used to improve the credibility of a research study (Meriam, 2009). Peer reviews involve asking a peer or “colleague to scan some of the raw data and assess whether the findings are plausible based on the data” (Merriam, 2009, p. 220). Merriam (2009) also explains that peer reviews can be performed by a colleague who is either familiar with the research topic or who is new to the topic. As a means to strengthen the accuracy of the research, a colleague, who at the time had conducted several qualitative research studies of his own, and who was “*all but*

*dissertation*” in his Ph.D. program (foreign language education), reviewed nearly all of the raw data as well as my data analysis. The peer reviewer was not an expert in field of self-monitoring interventions, however he had been a public school teacher for several years and was still working in the field of education as the director of a teaching center attached to a major university in the area in which this study took place. His experience in education provided him a general understanding of much of the content covered in the study.

Initially, I gave my colleague, the transcriptions of the pre-intervention interview and the first two email journals. I asked him to look over my transcriptions, the codes that I had extracted from the data, and the themes that had emerged. He examined the items I gave to him and then suggested we meet in person to further discuss the data.

Three weeks later I met my colleague in person to review all of the data, codes, and themes that I had obtained up to that point in time of the study. The data analyzed during this meeting included: the pre-intervention interview, all of the email journals, and the post-intervention interview. We met for a total of 1.5 hours to review the raw data, and the progress of my coding and theme development. I began the meeting by providing a brief overview of my study. During this overview, I shared with him a copy of the study’s abstract and the specific research questions guiding the study. After my colleague indicated he understood the purpose and design, he began reviewing the raw data. He first reviewed the raw data without looking at the codes I had developed and then reread the data referencing my codes. The purpose of the two readings was to test how closely matched his codes were to the codes I had assigned to the data. We found that the key

words and phrases that we highlighted in the raw data matched nearly 100% of the time. Additionally, my colleague, outside of minor word variations (e.g., experience/involvement and practice/rehearse) confirmed that the codes we used to categorize the data were similar. My colleague communicated that he felt my coding was accurate and consistent throughout data sources. Appendix N provides a summary of the peer review process.

### **Audit Trail**

The final method used to gain trustworthiness was to provide an audit trail (Lincoln, 1995; Merriam, 2009). An audit trail provides an account of how and when data were collected, how categories were derived and how decisions were made throughout the study (Merriam, 2009). Appendix L offers an outline of the data collection timeline including dates and sources of data. In the data analysis section I described how I coded the data and how themes were identified. Appendix M offers a visual of the theme development process and the peer review notes in Appendix N provide additional detail of the confirmation of the codes and themes that emerged.

### **Summary**

This chapter began with a restatement of purpose and research questions which led to a rationale for using an embedded, experimental, mixed methods research design. This rationale included an explanation of the philosophical assumptions which influenced the research methods. A description of the setting, the participants and the participants' rights followed, and inclusion criteria to participate in the study were outlined.

The next section of the chapter detailed the independent and dependent variables and outlined the quantitative and qualitative measures/procedures employed to collect the data: (a) The Strengths and Difficulties Questionnaire, (b) The Intervention Rating Profile (IRP-15), (c) semi-structured interviews, (d) email journals, and (e) direct observation of behavior data. Finally, a description of how the data was analyzed and interpreted was provided.

The final section of Chapter 3 focused on trustworthiness. This study used 4 strategies to promote trustworthiness or credibility: triangulation, member checks, peer review, and an audit trail. Overall, the chapter focused on providing both a rationale and a detailed description of all methods used in this study to honestly and accurately answer the research questions guiding this study.

## **CHAPTER 4:**

### **FINDINGS**

The primary purpose of this study was to investigate the extent to which a technology-based self-monitoring intervention impacted the academic engagement of three adolescent students with behavior problems. The secondary objective was to provide a comprehensive examination of the participating teacher perceptions (i.e., social validity) of *SCORE IT*. This chapter, begins with a restatement of the research questions leading into a description of the findings and themes relevant to answering each question. The research questions are as follows:

1. To what extent does the use of the self-monitoring iPad app, *SCORE IT*, improve the academic engagement of adolescent students with behavior problems?
2. What are teacher perceptions of the goals, procedures, utility, and outcomes (i.e., social validity) of *SCORE IT*, before, during and after implementation of intervention?

#### **Research Question 1**

*To what extent does the use of the self-monitoring iPad app, SCORE IT, improve the academic engagement of adolescent students with behavior problems?*

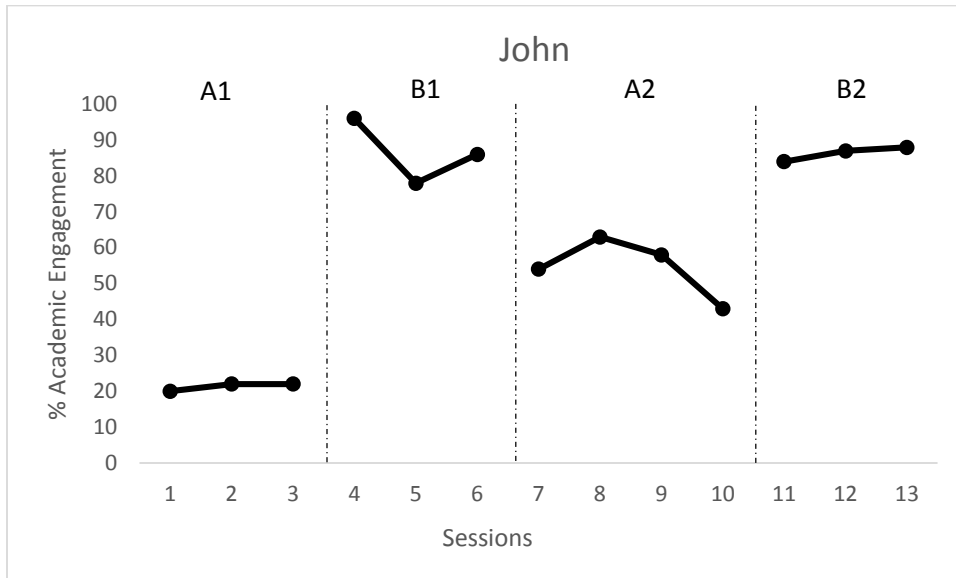
#### **John**

John was in baseline condition (A1) for three days and averaged 21.33% AE ( $SD = .94$ , Range = 20-22%). Intervention (B1) was introduced on the fourth day and there was an immediate increase in AE. During this first phase of intervention, John's average AE improved to 86.67% ( $SD = 7.31$ , Range = 86-96%) and intervention was

implemented with 100% fidelity. Return to baseline (A2) resulted in an immediate change in level as average AE dropped to 54.5% ( $SD = 7.37$ , Range = 43-63%). Return to baseline levels did not drop as low as what was demonstrated in the initial baseline phase, however the change in level was robust and remained stable. In the final phase, reinstatement of intervention (B2), AE returned to similar levels as what was demonstrated in B1, averaging 86.33% ( $SD = 1.7$ , Range = 84-88%,  $PND = 100\%$ ). Again, intervention was implemented with 100% fidelity. Figure 6 illustrates John's levels of AE in each phase of study.

Figure 5

John's % AE across all conditions of the study.



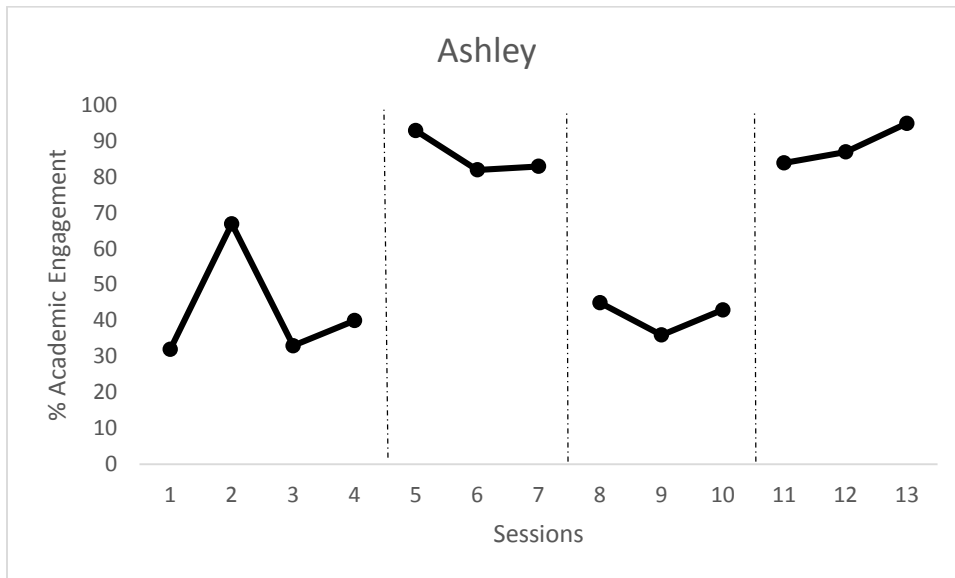
### Ashley

Ashley was in baseline condition for four days and averaged 43% AE ( $SD = 14.18$ , Range = 32-67%). Once low rates of AE stabilized, intervention was introduced and an immediate and substantial change in level was demonstrated with AE averaging 86% ( $SD = 4.97$ , Range = 82-93%). Upon withdrawal of intervention, Ashley's average AE decreased to 41.33% ( $SD = 6.68$ , Range = 36-45%). This level stabilized near levels of AE demonstrated in A1 and, thus, intervention was reinstated. In the final phase of the study (B2), Ashley averaged 88.67% AE ( $SD = 4.64$ , Range = 84-95%,  $PND = 100\%$ ). During both treatment conditions (B1 & B2), intervention was implemented with 100% fidelity. Figure 7 provides a visual of how Ashley responded to the implementation and withdrawal of intervention in all four phases of the study.



Figure 6

*Ashley's % AE across all conditions of the study.*

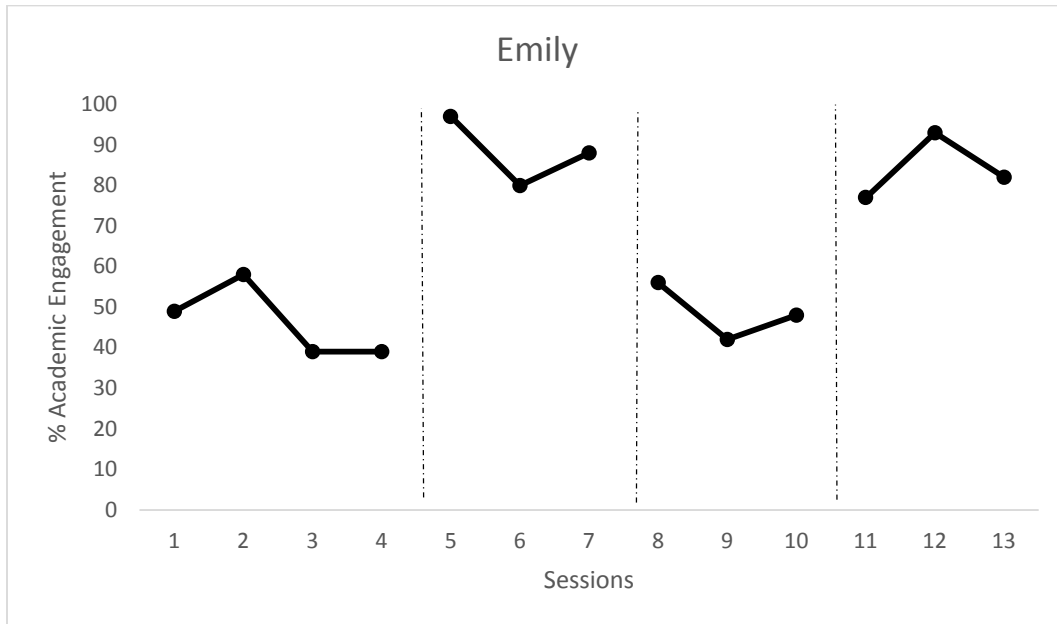


### **Emily**

In the initial baseline condition, Emily averaged 46.35% AE ( $SD = 7.92$ , Range = 39-58%). After four days of baseline condition, Emily's level of AE stabilized and intervention was implemented. An immediate increase in the level of AE was demonstrated with Emily's AE averaging 86% ( $SD = 4.97$ , Range = 82-93%). AE remained at high levels for three consecutive sessions before intervention was removed. Upon removal of intervention, levels of AE immediately dropped and averaged 48.67% ( $SD = 5.73$ , Range = 42-56%) which was slightly lower than what was demonstrated in the first phase of baseline. Once intervention was reinstated, AE again increased, averaging 84% ( $SD = 6.68$ , Range = 77-93%,  $PND = 100\%$ ) over three sessions. Intervention was documented as implemented with 100% of fidelity. Figure 8 illustrates Emily's changes in AE across all phases of intervention.

Figure 7

*Emily's % AE across all conditions of the study.*



Upon visual examination of the direct observation data, a significant and repeated change in the level of on-task behavior was demonstrated indicating a functional relation between the IV and the DV. A percentage of nonoverlapping data points (PND) was used to calculate effect size of the intervention for each student participant. PND is the percentage of Phase B data exceeding the single highest Phase A data point. It is the most widely published effect size index reported in single-subject work (Parker, Vannest, & Davis, 2011; Scruggs, Mastropieri, & Casto, 1987). Table 8 provides a summary of the quantitative analysis of the single-subject data.

Table 1

*Quantitative analysis of single-subject data.*

Participant	Mean % AE and SD for Each Phase				PND
	A1	B1	A2	B2	
<b>John</b>	21.33 (.94)	86.67 (7.31)	54.5 (7.37)	86.33 (1.7)	100%
<b>Ashley</b>	43 (14.18)	86 (4.97)	41.33 (6.68)	88.67 (4.64)	100%
<b>Emily</b>	46.35 (7.92)	86 (4.97)	48.67 (5.73)	84 (6.68)	100%

## Research Question 2

*What are teacher perceptions of the goals, procedures, utility, and outcomes (i.e., social validity) of SCORE IT, before, during and after implementation of intervention?*

### Themes

As described in Chapter 3, themes are identified patterns of data sets that are essential to describing a phenomenon (i.e., How do teachers' perceptions impact a teachers' quantitative and qualitative assessments of an intervention?) and answering a specific research question (i.e., What are teacher perceptions of *SCORE IT*?) (Creswell, 2009). In this study, after examining the frequency of the codes used in the transcription process, patterns of information were identified. These patterns of data developed into three central themes: (1) experiences, (2) utility, and (3) value. Figure 8 illustrates the prominent themes that emerged from both the quantitative and qualitative data sets.

Figure 8

*Theme development map*

Interviews	Email Journals	Direct Observation Data	IRP-15
<ul style="list-style-type: none"> <li>• <b>Experience</b></li> <li>• Access (tech)</li> <li>• Difficulties (tech)</li> <li>• Feelings</li> <li>• <b>Utility</b></li> <li>• Logistics</li> <li>• Time</li> <li>• <b>Outcomes(Value)</b></li> <li>• Thinking</li> <li>• Training</li> <li>• Distraction</li> <li>• Learning</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Experience</b></li> <li>• <b>Utility</b></li> <li>• Mobility</li> <li>• Logistics</li> <li>• <b>Value</b></li> <li>• Outcomes</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Outcomes (Value)</b></li> <li>• John-Avg. AE increased from 21.33%-86.33%</li> <li>• Ashely-Avg. AE increased from 43%-88.67%</li> <li>• Emily-Avg. AE increased from 46.35%-84%</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Outcomes (Value)</b></li> <li>• 74/90 IRP-15 Score</li> <li>• Conscience</li> <li>• Distraction</li> <li>• Focus</li> <li>• <b>Experience</b></li> <li>• Feelings</li> <li>• <b>Utility</b></li> <li>• Mobility</li> </ul>

Figure 8 includes all of the data sources (interviews, email journals, direct observation data and the IRP-15) that were used to answer research question #2. Found under each of the data sources is a list of the codes that were extracted from the transcriptions. Included under the direct observation data are the average percent changes to AE that were demonstrated from the first phase of the study to the final condition for each participant. In addition, under the IRP-15 data-set, the overall quantitative value of the teacher awarded score for the acceptability/social validity of the intervention can be found.

The codes/data highlighted in white font within Figure 8 were grouped under an umbrella theme (visually represented using black font color). These umbrella themes were present across all data-sets and were identified as central to answering research question #2. For example, under the data-set “interviews” the codes: access (tech),

difficulties (tech) and feelings (toward tech and self-monitoring) were not only less frequently found in the transcriptions of the pre and post interviews, they were also related to the more prominent code, experience, and hence were merged under this umbrella theme. The following sections of Chapter 4 offer evidence of the three major themes that developed out of the combined data.

### **Experience**

The theme experience refers to the degree to which Ms. Thompson communicated she had experience with and was comfortable using technology in her classroom. It also refers to the overall experience Ms. Thompson had as a classroom teacher. Ms. Thompson was an experienced classroom teacher who demonstrated and expressed confidence using technology in both her personal and professional life. She also communicated she was confident and excited to integrate new ideas, interventions and technologies in her classroom. Evidence of Ms. Thompson's experience with and attitude toward technology and self-monitoring interventions is detailed in the remainder of this section.

During the initial interview, Ms. Thompson stated that she, enjoyed using technology in her classroom. She expressed a desire for her school/district to purchase more technology, such as clickers for the students to use for survey responses during small and whole group discussions. She emphasized that she used the SMART Board every day in her room and that she was excited to learn how to use different types of technology to help students meet individual learning goals.

When asked if there was anything she disliked about using technology in her classroom, she stated that she gets frustrated when it (technology) doesn't work and wastes our time. She shared that they have access to a classroom set of netbooks, however she communicated she doesn't use them (netbooks) because they, don't connect to the internet easily and act glitchy. However, Ms. Thompson also emphasized that of the technology she does use in her room, it (the technology) typically does work well, and she rarely experiences difficulties.

When Ms. Thompson was asked if she had ever used a self-monitoring intervention with a student, she replied that she had used self-monitoring as a behavioral intervention twice, with two different students, prior to participating in this study. She stated that self-monitoring worked well for one but not so well with another. She also stated that she was aware that self-monitoring interventions can be very affective at changing a student's behavior and that she was anxious to learn more about how to implement this (*SCORE IT*) self-monitoring intervention.

Overall, in the pre-intervention interview, Ms. Thompson conveyed a positive attitude toward technology and self-monitoring interventions. The only negative encounter she described with technology was with her classroom set of netbooks, and even then, she attributed this to the age of the netbooks and the need for the district to invest in new technology. On multiple occasions in the interview she communicated that she had a lot of experience using technology in both her personal and professional life and felt very comfortable incorporating new technologies into her instruction. She expressed a similar comfort level with using self-monitoring interventions.

Evidence of Ms. Thompson's experience and level of comfort using technology with self-monitoring interventions was also demonstrated in the first email journal. Ms. Thompson reported that whereas she was familiar with using excel spreadsheets with interventions to keep track of academic and behavioral progress, she had never used technology, besides paper/pencil, with a self-monitoring interventions. She also shared that she was, "excited to give it (the technology) a try."

During the post-intervention interview, Ms. Thompson shared that one of her favorite experiences with the *SCORE IT* intervention was watching the students rate their behavior. She communicated that the students were, much harder on themselves (in terms of the rating they gave themselves) than she was. She added that it was, meaningful and interesting to watch the students go back and forth between ratings as they tried to decide which score best represented the extent to which they met each of the behavior expectations. She shared that by watching this process (self-recording), she was able to witness the students "really thinking about their behavior and trying hard to stay focused."

### **Utility**

The theme, utility of the intervention was present throughout all phases of the study. By utility, I mean how the participants used/interacted with the *SCORE IT* intervention. During the pre-intervention interview, when Ms. Thompson was asked if she had any apprehensions about using *SCORE IT*, she stated that her only concern had to do with the "logistics" of the intervention. She explained, I'm (Ms. Thompson) mostly worried about where I'm going to put the iPad. She highlighted that she didn't want the

process of the intervention (accessing the iPad and inputting behavior scores), interrupting the flow of learning and teaching.

In addition, Ms. Thompson communicated she was a little nervous about how the other students in the room would react when they learned the three study participants were using an iPad during class time. Ms. Thompson shared that her students loved using technology and she anticipated some students would feel disappointed they weren't getting to use an iPad.

In the second email journal, Ms. Thompson communicated that she was unsatisfied with the process the students were using to input their behavior scores within the app. At this point in the study, at the conclusion of each 10-min interval, all three students were leaving their work space and walking to Ms. Thompson's desk to input their behavior ratings into the app. Ms. Thompson explained that this process was distracting and unnatural and expressed a desire to change how the students accessed the iPad to record their scores. She communicated that upon hearing the 10-min interval prompt, she would like to try walking the iPad to each of the students, as opposed to the students walking to the iPad. She hypothesized that this would take less time and would be less distracting for all of the students in the classroom. I immediately responded to her email and encouraged her to try this new method beginning the next day.

The third email prompt asked Ms. Thompson to tell a story about using the app. Ms. Thompson chose to describe how she took advantage of the mobility of the app by walking the iPad to the students to record their behavior scores as opposed to the students walking to the app after each of the 10-min intervals. Ms. Thompson further explained



that walking the iPad to the students seemed much more natural and was a lot less distracting. She shared that as she walked the iPad to each of the students, and as they recorded their scores within the app, she was able to continue to provide instruction to the rest of the class with little interruption or distraction.

In this third email journal, Ms. Thompson also shared how much she enjoyed observing her students rate their behavior. She communicated that as she watched them (the participating students) struggle to decide which score most accurately represented the extent to which they had met each of the behavior expectations, she could see how much thought and effort they were putting into thinking about their behavior. She reported she was surprised at how valuable the mobility of the intervention was; allowing her to see her students be reflective of their behavior. She stated that this was a powerful feature for both her and her students.

In the fourth email journal, Ms. Thompson communicated the biggest issues she had with the intervention were related to logistics or procedures associated with getting the iPad to the students. Ms. Thompson shared that the intervention was, much less distracting and easier to use once she began taking advantage of the mobility of the iPad and walking the device to each of the students at the end of the 10-min intervals. She added this allowed her to, continue to provide instruction to the whole class and to view the students thinking about which score to input into the iPad. She explained that by viewing this self-recording process, she was able to see, “how much effort the students were putting into this intervention. Ms. Thompson suggested that when training teachers

how to use *SCORE IT*, more time and emphasis should be placed on where to put the iPad and the process that the students and teachers will use to input their scores.

In the post-intervention interview, Ms. Thompson stated that she originally wanted the students to come to her desk to input their behavior scores because she felt the students would be too distracted by having an iPad in arms-reach. However, during this interview, Ms. Thompson stated that she now believes the students would do fine with having an iPad on their desk. She further explained that they (the participating students) seemed motivated to stay focused and wouldn't be distracted if the iPad sat on their desk.

She also stated that the process of having the students rate their behavior "improved a lot" after she started walking the device to the students, as opposed to the students coming to her desk to record their behavior scores. She commented that if she was training a teacher on how to use the app, she would "recommend they (the teacher) either set an iPad on or near the students' desk or walk the iPad to the students."

### **Value**

The theme, value of the intervention, was closely connected to student outcomes, meaning to what extent did Ms. Thompson perceive the intervention to positively impact student behavior. For example, when Ms. Thompson was asked in the pre-intervention interview, How valuable do you predict you will find the *SCORE IT* intervention? Ms. Thompson replied she believes interventions to be valuable if they improve student behavior or a specific skill a student is having difficulty with. She went on to explain that if *SCORE IT* could help even one of the student participants stay focused in class, she would find the intervention to be valuable.

Furthermore, during the pre-intervention interview, Ms. Thompson was asked to think about specific expectations she had for student outcomes. She stated that she wasn't expecting miracles and knew that there wasn't a quick fix. However, she did hypothesize that the app would, help the students to think more about what they are really doing in class. She shared that she was hopeful she would see improvements with one or two of the participating students' *on-task* behavior during class time.

In the first email journal, Ms. Thompson reported that prior to this study, she had used a paper/pencil version of a self-monitoring intervention twice, once for 2 different students. Ms. Thompson disclosed that the intervention had worked well for one student and not as well for the other. She explained that while one student became more aware of their behavior, the other student did not. She hypothesized that the student who did not benefit from the intervention had, too many complicated issues and needed something more intense than the intervention she had created. Ms. Thompson expressed she was hopeful that at least one of the three students in this study would respond positively to the intervention and learn how to think about their behavior.

In the second email journal, Ms. Thompson again discussed her expectations for student outcomes. She reiterated that she was hopeful *SCORE IT* would make the students more aware/conscience of how often they are doing other things or in la-la land. She explained that she wasn't expecting miracles but was optimistic that at least one of the three participating students would learn from this experience and become more aware of their behavior during class time.

Ms. Thompson began her fourth email journal by disclosing how surprised she was at how much difference the intervention made in their (the participating students) behavior. She explained that she could see a marked improvement in how much more the three students were participating and in-tune with what was going on in the class. She also added that the students enjoyed using the app and were motivated to use the intervention.

Student outcomes was another topic that the teacher highlighted throughout the post-intervention interview. When asked if she noticed any behavior changes with the students since they started using the app, she immediately responded, “Yes. I’m actually really surprised at how much more they (the participating students) are participating in class. I’m seeing a lot less drawing (doodling unrelated to the task at-hand) on their work and John doesn’t wander around the room as much.”

During the post-intervention interview, Ms. Thompson shared that one of her favorite experiences with the *SCORE IT* intervention was watching the students rate their behavior. She communicated that the students were, much harder on themselves (in terms of the rating they gave themselves) than she was. She added that it was meaningful and interesting to watch the students go back and forth between ratings as they tried to decide which score best represented the extent to which they met each of the behavior expectations. She shared that by watching this process (self-recording), she was able to witness the students really thinking about their behavior and trying hard to stay focused.

## IRP-15

The IRP-15 is a 15-item questionnaire, using a 6 point Likert-type scale, designed to quantitatively assess teacher perceptions of an intervention (Appendix H). Total scores can range from 15-90 with high scores reflecting high levels of acceptability/social validity of an intervention. A moderate level of acceptability would require a total summed score of 52.5 (Marten, Witt, Elliot, & Darveaux, 1985). Upon completion of all four stages of the intervention (A1-B1-A2-B2), Ms. Thompson evaluated *SCORE IT* using the IRP-15. The summed scores from the teacher completed IRP-15 totaled 74/90 points, indicating a high rate of teacher accessibility/social validity.

After the calculations from the IRP-15 were obtained, the qualitative data from the pre and post intervention interviews, email journals, and the open-ended questions included on the bottom of the adapted version of the IRP-15 questionnaire were merged with the quantitative scores. Table 1 provides a visual of how the quantitative data from the IRP-15 was converged with the qualitative data. This table displays: (1) the question item on the IRP-15, (2) the score that the teacher awarded each question and (3) evidence of congruent or discrepant qualitative data to either support or contradict the awarded score.

Table 2

*Mixed methods analysis of IRP-15 scores and interview data.*

IRP-15 Question	Irp-15 Score (1-6)	Qualitative Data	
		Congruent Data	Discrepant Data
This was an acceptable intervention for the student's problem behavior.	5	"Yes. I'm actually really surprised at how much more they (the participating students) are participating in	

		<p>class. I'm seeing a lot less drawing on their work and John doesn't wonder around the room as much." (post-intervention interview, March 26)</p> <p>She shared that she felt one of the reasons the intervention was "successful" was because the students were "highly motivated to use the iPad."(Email journal, #4, March 25)</p>	
Most teachers would find this intervention appropriate for behavior.	5	<p>"Easy to use" and "would be easy to train other teachers how to use it."(post-intervention interview, March 26)</p>	<p>"At times the scoring process seemed unnatural and distracting."(Email journal #3, March 11)</p> <p>"Sometimes it (<i>SCORE IT</i>) seemed like an interruption." (post-intervention interview, March 26)</p>
This intervention was effective in changing the child's problem behavior.	5	<p>"I'm surprised at how much difference the intervention has made in their (the participating students) behavior."(Email, journal #4, March 25)</p> <p>"I liked seeing the growth these kiddos showed in their behaviors." (post-intervention interview, March 26)</p> <p>"the students were really thinking about their behavior and trying hard to stay focused." (post-intervention interview, March 26)</p>	
I would suggest use of this intervention to other teachers.	5	<p>"Easy to use" and "would be easy to train other teachers how to use it."(post-intervention interview, March 26)</p> <p>"I'm surprised at how valuable the mobility of the</p>	<p>"Sometimes it (<i>SCORE IT</i>) seemed like an interruption." (post-intervention interview, March 26)</p>

		intervention is. It allows me to see the students be reflective of their behavior. This is a powerful feature for both me and my students.”(Email journal #3, March 11)	
The child’s behavior problem was severe enough to warrant use of this intervention.	4	John’s SDQ score = “very high” for concentration difficulties and “medium risk” for concentration <i>disorder</i> .  Ashley’s SDQ score = “very high” for concentration difficulties and “medium risk” for concentration <i>disorder</i> .  Emily’s SDQ score for concentration <i>disorder</i> = “medium risk.”	Emily’s SDQ score = “slightly raised” for concentration <i>difficulties</i>
Most teachers would find this intervention suitable for the behavior problem described.	5	“Yes. I’m actually really surprised at how much more they (the participating students) are participating in class. I’m seeing a lot less drawing on their work and John doesn’t wonder around the room as much.”(Email journal #4, March  “Easy to use” and “would be easy to train other teachers how to use it.”(post-intervention interview, March 26)  “It would be nice if other teachers could download this app from the app store.”(Post-intervention interview, March 26)	“I suggest that when teachers are trained to use <i>SCORE IT</i> , more time and emphasis be placed on where to put the iPad and the process that the students and teachers use to input their scores.”(Email journal #4, March 25)
I would be willing to use this intervention in the classroom setting again.	6	“I have enjoyed seeing the kids click on the expectations in the app to remind them what the exact definition for those expectations are...what it means and what it looks like.”(Email journal #2, March 4).	“Sometimes it was hard to do the iPad rating scale when the timer when off because of what was going on in the classroom.”(IRP-15, March 26)

		<p>“Yes. I’m actually really surprised at how much more they (the participating students) are participating in class. I’m seeing a lot less drawing on their work and John doesn’t wonder around the room as much.”(Email journal #4, March 25)</p> <p>“I liked seeing the growth these kiddos showed in their behaviors.” (post-intervention interview, March 26)</p> <p>“If it’s possible, I would like to keep using the app until the end of the year.”(post-intervention interview, March 26)</p> <p>“It (<i>SCORE IT</i>) was great.”(IRP-15, March 26)</p>	
This intervention did not result in negative side-effects for the child.	<b>6</b>	<p>“The students enjoyed using the app. They were motivated to use the intervention.”(Email journal #4, March 25)</p> <p>“I liked seeing the growth these kiddos showed in their behaviors.” (IRP-15, March 26)</p> <p>“It (<i>SCORE IT</i>) was great.”(IRP-15, March 26)</p>	
This intervention would be appropriate for a variety of children.	<b>5</b>	<p>“It’s important for the students to learn to be aware of their behavior” (pre-intervention interview, February 25).</p> <p>“<i>SCORE IT</i> is easy to use.”(post-intervention interview, March 26)</p> <p>“The students enjoyed using the app. They were motivated to use the intervention.”(Email journal #4, March 25)</p>	



This intervention was consistent with those I have used in classroom settings.	3	"I haven't ever used technology with a self-monitoring intervention" (email journal #1, February 26).	
The intervention was a fair way to handle the child's problem behavior.	5	"The students enjoyed using the app. They were motivated to use the intervention." (Email journal #4, March 25)  "I liked seeing the growth these kiddos showed in their behaviors." (IRP-15, March 26)	
This intervention was reasonable for the behavior problem described.	5	"The students enjoyed using the app. They were motivated to use the intervention." (Email journal #4, March 25)	"Sometimes it ( <i>SCORE IT</i> ) seemed like an interruption." (open ended IRP-15 question, March 25)
I liked the procedures used in this intervention.	5	" <i>SCORE IT</i> is easy to use." (post-intervention interview, March 26)	"Sometimes it ( <i>SCORE IT</i> ) seemed like an interruption." (open ended IRP-15 question, March 25)  "Sometimes it was hard to do the iPad rating scale when the timer went off because of what was going on in the classroom." (post-intervention interview, March 25)

Analyzing the qualitative data with the IRP-15 scores helps to determine if the teacher was consistent with her evaluation of the intervention. This table provides evidence that Ms. Thompson's quantitative ratings of the acceptability of the intervention were compatible with how she qualitatively communicated her perceptions of *SCORE IT* throughout the study. Documentation of this compatibility supports the conclusion that Ms. Thompson provided valid and reliable perceptions of the value and feasibility of the intervention.

## **CHAPTER 5:**

### **DISCUSSION**

As described in Chapter 2, self-monitoring is a type of self-management strategy in which students are taught to think about their behavior and record the extent to which the behavior occurred. Interventions designed to strengthen self-monitoring skills have been successful at reducing problem behaviors and increasing student attention and productivity (Bruhn, et al., 2015; Harris et al., 2005; Mooney et al., 2005; Reid et al., 2005; Rock, 2005, Shimabukuro et al., 1999). Positive reports of behavioral outcomes from self-monitoring studies are particularly promising considering students with, and at risk of an EBD often struggle with self-management skills (i.e., difficult time demonstrating a developmentally appropriate level of self-control, attending to instruction, connecting new information to previous experiences, and creating/maintaining a productive work environment (Barnard-Brak et al., 2011; Carr & Punzo, 1993; Carter et al., 2011; Gillberg et al., 2004; Kauffman & Landrum, 2009; Mooney, 2003; Mooney et al., 2005).

And yet, despite the massive surge of technology devices in K-12 classrooms (Hew & Brush, 2007), there are few empirical studies investigating the use of technology with self-monitoring interventions (Bedesem, 2012; Bruhn et al., in press, Gulchak, 2008; Szwed & Bouck, 2013). Both practitioners and researchers acknowledge the need for technology-based devices and methods to assist with the process of collecting and analyzing data to address academic and behavioral goals (Wagner et al., 2006).

It has also been documented that much of the self-monitoring literature includes studies examining the effects of packaged self-monitoring interventions (Bruhn, et al. (2015). That is, the interventions have multiple components such as high rates of adult feedback and reinforcement for meeting goals or following procedures. Another issue brought to light in the review of self-monitoring literature was the lack of information on teacher perceptions of social validity. Although self-monitoring has been generally thought of as a practical and feasible intervention (Harris et al., 2005; Mooney et al., 2005; Reid et al., 2005; Rock, 2005, Shimabukuro et al., 1999), the use of technology adds a layer of complexity warranting further examination.

The goal of this study was to address the aforementioned gaps (Chapter 2, p. 51) found in the self-monitoring literature: (a) the need for future research to examine the extent to which individual components of self-monitoring (i.e., reinforcement, feedback, goal setting) impact student behavior, (b) an underrepresentation of technology used with self-monitoring interventions, particularly with regards to automating self-monitoring procedures (recording, calculating, graphing, and storing data in real time), and (c) the limited reports of consumer perceptions (i.e., social validity) of the intervention. A mixed methods research design was employed to answer the following research questions: (a) To what extent does the use of the self-monitoring iPad app, *SCORE IT*, improve the academic engagement of adolescent students with behavior problems? and (b) What are teacher perceptions of the goals, procedures, utility, and outcomes (i.e., social validity) of *SCORE IT*, before, during and after implementation of intervention?

For all three student participants (John, Ashley and Emily), who were identified by their teacher as frequently being off-task and disengaged during class time and were considered “at risk” for hyperactivity/concentration disorder (SDQ), the *SCORE IT* intervention increased AE. Visual analysis of the graphed AE data indicated a change in behavior (AE) consistent with the manipulation of the intervention (*SCORE IT*); demonstrating a functional relation between the IV and DV for all three students (Kazdin, 2011; Kennedy, 2005). For John, these results were most impressive considering his low levels of AE during the initial baseline phase of the study. Even though Ashley and Emily’s initial levels of AE during the first baseline conditions were not as low as John’s, their results clearly indicated a relation between the intervention and the amount of time they spent academically engaged during class time. These findings were similar to previous studies of technology-based self-monitoring interventions (Bedesem, 2012; Bruhn et al., in press; Gulchak, 2008; Szwed & Bouck, 2013; Wills & Mason, 2014).

Unlike the previous studies examining the impact of *SCORE IT* on student behavior (Bruhn et al., in press), this study removed the self-monitoring component of reinforcement and greatly reduced the components of feedback and goal-setting. In the Bruhn et al. (in press) study, it was reported that the student participant identified as “Jess” stated the most significant part of the intervention, *SCORE IT*, was “meeting my (Jess’) goal.” This statement left the authors questioning if any reinforcement was necessary for *SCORE IT* to positively impact student behavior. This qualitative information reported in the Bruhn et al. (2015) study motivated me to test the impact *SCORE IT* had on student behavior excluding the component of reinforcement.

In addition to the Bruhn et al. (in press) study, other previously published self-monitoring studies indicated a need to examine the unique contributions of the various components that are often packaged with self-monitoring (i.e., feedback, reinforcement, goal-setting; Joseph & Eveleigh, 2010; Sheffield & Waller, 2010; Webber et al., 1993). While this study completely removed the component of reinforcement, the feedback and goal-setting elements remained present but played limited roles in this study. When comparing the results of the previous *SCORE IT* studies (including reinforcement, feedback, and goal-setting) with the results of this study (limited use of feedback and goal-setting, and the elimination of reinforcement), comparable improvements to the target behavior were reported. For example, in the Bruhn et al., in press study examining the effects of *SORE IT* on the AE of an adolescent boy with documented behavior difficulties, average AE improved from 48.33% to 82.05%. In this study, Emily's average AE was documented as 46.35% at the beginning of the study and improved to 84% by the end of the final phase of intervention. This evidence seems to suggest that the exclusion of reinforcement and limited roles of feedback and goal-setting did not negatively impact the effects that *SCORE IT* had on AE. Still, future research is needed to directly examine the components of feedback, reinforcement, and goal-setting with the *SCORE IT* intervention.

This research also extends previous examinations of *SCORE IT* by implementing the intervention in a setting outside of a *READ 180* classroom. Because the outcomes obtained in this study were similar to those reported in previous studies of *SCORE IT*, it is plausible *SCORE IT* may be effective in a range of classroom settings, not just *READ*

180. This is particularly relevant considering the majority of students with, or at risk of an EBD are receiving all of their education and school experience in the general education classroom (Forness, Kim, & Walker, 2012).

In addition, the literature suggests teachers need more training and practice using evidence-based teaching strategies that have demonstrated efficacy in improving outcomes for students with, and at risk of an EBD (Ryan, Pierce, Mooney, 2008). Perhaps self-monitoring is one evidence-based intervention that requires little training and may be effective in improving academic engagement of students with persistent behavior problems, and specifically hyperactivity/inattention, in a general education classrooms. Whereas the qualitative data obtained from this study did reveal that the teacher had difficulties with establishing a seamless process to access the iPad (logistical issues), it seems likely that this data can be used to avoid encountering this issue in the future. Overall, the teacher reported that the intervention was user friendly and easy to implement and maintain.

In response to an increased demand from special education experts to further examine the perceived value and feasibility of classroom interventions (Finn & Sladeczek, 2001; McDuffie & Scruggs, 2008), this study aimed to analyze teacher perceptions of *SCORE IT*. As documented in the review of literature in Chapter 2, teacher perceptions of interventions are critical to consider prior to implementation of an intervention; the more positive a teacher views an intervention the more likely the teacher is to implement the intervention with fidelity (Greenwood & Abbott, 2001; Horner et al, 2005; Finn & Sladeczek, 2001; McDuffie & Scruggs, 2008). This study was designed to

use both qualitative and quantitative data, using a mixed methods approach, to provide a rich and complete analysis of the teacher perceptions of *SCORE IT*, particularly regarding the goals, procedures, utility, and outcomes of the intervention, in hopes of testing and sharing an intervention which teachers perceive to be worthwhile.

Similar to previous studies evaluating the social validity of an intervention, a quantitative survey (IRP-15) was included in this study to assist in analyzing the participating teacher perceptions of *SCORE IT* (Bruhn et al., in press; Wills & Mason, 2014). In addition to the IRP-15, qualitative data were collected through interviews and e-mail journals. The data obtained from the teacher completed version of the IRP-15 along with the fidelity checklist provided a quantitative value representing favorable perceptions of the intervention. The qualitative data generated themes allowing for an in-depth analysis of how the teacher was perceiving the intervention throughout the duration of the study. Collectively, these data indicated the teacher viewed positively the goals, procedures, utility, and outcomes of *SCORE IT*, suggesting *SCORE IT* could be a practical and feasible self-monitoring intervention for adolescent students who struggle with AE in a general education classroom environment.

Unlike the data obtained from the IRP-15 and the intervention fidelity checklist, the qualitative data revealed complications with the procedures/utility of the intervention which warrants further attention and discussion of the set-up/implementation of *SCORE IT*. Specifically, the teacher initially struggled with creating/adopting seamless procedures for students to input their behavior scores within the app. We conversed and collaborated to identify a solution for these procedural issues. This indicates additional

training and support may have been necessary prior to implementation. In the future, this may include extended practice with the students to settle any procedural issues that are unique to individual classrooms, teachers, and students prior to implementation of intervention.

Due to the nature of single-subject work, it was possible to alter intervention procedures slightly, to meet the needs of the teacher without compromising the integrity of the intervention. That is, I was able to work with the teacher directly to find a more feasible way for students to access the iPad without disrupting the flow of the class and, thus, increase teacher satisfaction. Changing these procedures did not fundamentally change the self-monitoring process. Rather, this small but important change made it easier for the teacher and student to access the iPad in a non disruptive way. Had I not been able or willing to make the requested changes to the scoring process, it seems logical that the teacher would have reported being less satisfied with, and less likely to continue to use, the intervention.

Support of this hypothesis can be found in Chapter 2 under the discussion of social validity research. Authors of social validity research have documented that when teacher participants are provided ample opportunity to voice concerns and opinions regarding interventions, and furthermore are allowed to make changes to programs and interventions to be used in the classroom, their perceptions towards, and maintenance of the intervention increases (Bornstein & Rychtarik, 1983; Fuqua & Schwade, 1986; Lebow, 1982; McMahon & Forehand, 1983; Ware, Davies-Avery, & Stewart, 1978).



It is also important to note that the favorable social validity findings (numerical ratings and qualitative reports) in this study align with the findings in previous self-monitoring studies, including those reported in the Bruhn et al. (in press) study. For example, authors of the Bruhn et al. (in press) study highlighted that one of the more interesting results from the adapted version of the IRP-15 came from one of the participating students who expressed the intervention made him be good and he didn't like being good, exemplifying how the meta-cognitive process of self-monitoring (thinking about and observing one's own behavior) can result in a process of corrective behavioral change (Bandura, 1991). This finding corresponds with this study's hypothesis that the elements of goal-setting, reinforcement, and feedback may not play as large of a role in the improvements to target behaviors as does the actual act of self-monitoring, actively thinking about one's own behavior.

Overall, this study expanded the self-monitoring literature by examining: (a) the extent to which self-monitoring without reinforcement impacts student behavior, (b) testing a technology-based self-monitoring application in a general education environment, and (c) including a qualitative analysis of teacher perceptions of an the intervention. The following section builds on the unique contributions of this study to the self-monitoring literature by offering specific recommendations for practice.

### **Recommendations for Practice**

Based on findings from this study, along with the findings from previously published research examining the effects of various self-monitoring interventions, recommendations for implementation are provided: (a) clearly state and communicate

(with the student) the behavioral objective, (b) ample time for practice of implementation of intervention, (c) progress monitoring of the intervention, and (d) collection of maintenance data (thinning of intervention).

As described in the self-monitoring review of literature in Chapter 2, self-monitoring is a skill, students are trained to use, to monitor, and evaluate their own behavioral performance (Mooney et al., 2005; Nelson & Hayes, 1981; Reid, 1996). In order for a student to be able to monitor, and evaluate a behavior, it is necessary for the teacher to provide the student with a definition, including examples and nonexamples, of the behavior. This will ensure that the student and teacher are monitoring the same behavior using the same definition.

Potentially the most practical outcome of this study, was what can be learned from the logistical difficulties the teacher had with the intervention. Even though the teacher was provided the ability to choose how the students would access the iPad to input their behavior scores, the teacher still reported complications with the process that was initially established. It is recommended that the teacher and student engage in several practice runs of the intervention, under the same conditions that the intervention will be implemented, prior to the start of data collection. Further, in the beginning stages of implementation, it is recommended that daily monitoring of the intervention procedures takes place and necessary adjustments are made in a timely manner. For example, if the process in which a student and teacher are using to access the iPad is negatively impacting instruction or the flow of the classroom environment, alterations to this process may be necessary.

Upon demonstration of the target behavior improving with the use of a self-monitoring intervention, it is also recommended that the teacher continue to use the intervention, collect data, and make decisions about how the intervention will be faded over time. For example, a teacher may consider raising the stakes (i.e., the PPB goal line) of an intervention, or reducing the number of behaviors the student is monitoring. This is to ensure that a student does not become overly dependent on the intervention and will start to independently monitor his or her own behavior without prompting.

### **Limitations and Recommendations for Future Research**

Although these findings are mostly positive, this study is not without limitations. The study limitations include: (a) the lack of generalization and maintenance probes, (b) limited number of data points included in each phase of the single-single subject study, (c) the exclusion of data representing student perceptions of the intervention, (d) the inability to determine the unique contribution of *SCORE IT* on the change in behavior, (e) the absence of academic data, and (f) the novelty of technology.

### **Generalization and Maintenance Probes**

Although generalization and maintenance probes were not included in this study, in the 4<sup>th</sup> email journal, as well as in the post-intervention interview, the teacher reported that she noticed all three students demonstrated higher rates of academic engagement, along with improved student work, across all content areas. However, data were not collected in generalization settings to confirm this. With regards to maintenance, although no maintenance data were collected, maintenance programming recommendations for continued use of *SCORE IT* were provided to the teacher. For all

three students, recommendations included raising the PPB goal line from 70% to 75%, increasing the interval time periods in increments of 2-3 minutes, and reducing the number of behaviors the students were monitoring (i.e., only monitor *Be Ready* as opposed to monitoring all three behaviors).

In future studies, researchers should examine to what extent students are able to generalize self-monitoring skills to other settings. In other words, does the demonstration of improved behavior/work transfer to environments outside of where the intervention is taking place? Furthermore, researchers should investigate how student behavior maintains over time. Are students able to continue to demonstrate similar levels of positive behavior, as seen in intervention conditions in this study, as well as in previous technology-based self-monitoring literature (Bruhn et al., in press; Gulchak, 2008; Mills & Mason, 2014), with or without *SCORE IT*, after the conclusion of the study?

Related to maintenance, another component of *SCORE IT* that needs additional examination is how teachers use the graphed data within the app to make intervention decisions. Previous studies have made intervention decisions based on the researcher examining the trend, level, and stability of graphed direct observation of behavior data (Bedesem, 2012; Bruhn et al., in press; Gulchak, 2008; Mills & Mason, 2014; Szwed & Bouck, 2013). Training the teacher how to use and take advantage of all the features programmed within *SCORE IT* (calculating, graphing, and storing behavior data) could assist them to make data-based decisions concerning both the use of the intervention and the instruction they are providing. This characteristic of *SCORE IT* is particularly beneficial considering both the educational measurement and special education literature

supports the use of evidence-based procedures to maximize teaching effectiveness (Deno, 2003; Fuchs, Deno, & Mirkin, 1984; Ryan, Pierce, & Mooney, 2008). Additionally, this feature aligns with the concepts that are outlined in IDEA as well as NCLB which requires students undergo effective instruction and progress monitoring before entering special education. That is, students should be given an opportunity to respond to an evidence-based intervention, and response to that intervention should be documented through frequent progress monitoring.

### **Number of Data Points**

Documentation of a predictable pattern of behavior between intervention conditions requires multiple data points (three-five) within each phase of a single-subject design (Horner et al., 2005; Kazdin, 2011). In this study, most of the conditions (A1-B1-A2-B2) are comprised of the minimum number of data points (three) to document a behavior pattern. Because there is evidence of a significant change in the level of AE between phases, three data points in most of the study conditions were suffice to establish a behavior pattern. To help strengthen the documentation of this pattern, it is recommended that future research include additional data points in each condition.

### **Student Perceptions**

In Chapter 2, the social validity literature highlighted a discrepancy between quantitative findings of how teachers perceive the intervention and qualitative data examining how the teachers continue to use and maintain the intervention (Schwartz & Baer, 1991). Although this study built on existing literature by including a qualitative analysis of perceived consumer feasibility and value of the intervention, the study did not

include an analysis of student perceptions of the intervention. Like the teacher, the students are consumers of the intervention and in order to make data-based decisions concerning the composition of, and training on, the use of classroom interventions, it is critical that researchers are able to identify which features and components of these interventions are most/least helpful to *all* users. It is recommended that future research examine both student and teacher perceptions of the goals, procedures, utility, and outcomes of the intervention.

### **Unique Contribution of *SCORE IT***

A major limitation/criticism documented in the self-monitoring (with and without technology) literature is an inadequate representation of the extent to which individual components of self-monitoring interventions (reinforcement, goal-setting, feedback) impact student behavior (Joseph & Eveleigh, 2010; Sheffield & Waller, 2010; Webber et al., 1993). In the Bruhn et al. (2015) review of self-monitoring interventions, it was reported that 25 out of the 41 studies included the intervention component of feedback and of these 25 studies, 24 of them also included reinforcement. Furthermore, in the Bruhn et al. (in press) article of the *READ 180, SCORE IT* intervention, *SCORE IT* was packaged with goal setting, reinforcement, and feedback. To build on the self-monitoring literature, this study excluded the component of reinforcement and limited the extent to which feedback and goal-setting were included in the intervention.

Even though the exclusion of reinforcement with *SCORE IT* offered a different analysis of the impact that *SCORE IT* has on student behavior, continued research is

needed to examine the extent to which *SCORE IT* alone and/or *SCORE IT* packaged with various combinations of self-monitoring components, affects behavior.

### **Absence of Academic Data**

Given the known academic skills deficits of students with, and at risk of an EBD, researchers have begun to place an increased emphasis on monitoring and improving the academic skills of this student population (Mooney et al., 2005; Ryan et al., 2008; Wehby et al., 2003). Although this study built upon the self-monitoring literature examining behavior outcomes for students with, or at risk of an EBD it is recommended that future research include academic measures. For example, it would be helpful for research to include a pre and post content area assessment or content area curriculum-based measurements (CBMs) to monitor the academic progress of students while also examining the impact that the self-monitoring intervention has on behavior.

### **Novelty of Technology**

Novelty effects occur when the results of a study are due to the novelty of a treatment. Novelty effects pose a threat to external validity because they make it difficult to know if the results of the study are due to a treatment that works or due to the novelty of a treatment (Johnson & Christensen, 2012). In the case of this study, specifically because Ms. Thompson communicated that her students were highly motivated by technology (pre-intervention interview), it is difficult to determine to what extent the change in behavior can be attributed to the act of self-monitoring or the newness of using an iPad. It is recommended that future studies be implemented with students who are

accustomed to using iPads in the classroom and/or for the study to occur over a longer period of time, allowing for the novelty of the new technology to dissipate.

### **Conclusions**

Considering the extent to which students with and risk of an EBD struggle in school, studying the effectiveness and social validity of interventions for this target population is meaningful across all areas and grade levels in our K-12 schools (Forness, Kim, & Walker, 2012; Ryan et al., 2008). It is with the use of evidence-based interventions, interventions which have proven to be feasible for teachers and students to implement and maintain, that we can begin to improve the dismal outcomes for students with behavioral difficulties (Forness, Kim, & Walker, 2012; Lane, et al., 2009; Nelson et al., 2004; Ryan et al., 2008). The purpose of this study was twofold: (a) to analyze the extent to which the *SCORE IT* intervention impacted the AE of adolescent students with behavior problems, and (b) to recognize teacher perceptions of the goals, procedures, and outcomes (i.e., social validity) of *SCORE IT*, before, during and after implementation of intervention.

The results of this study both support and extend the technology-based self-monitoring literature. The demonstrated functional relation between the intervention and student behavior, along with the overall positive teacher perceptions of the intervention further indicate that technology-based self-monitoring interventions can be an effective and feasible strategy to improve the AE of adolescent students who are experiencing behavioral difficulties in a classroom setting.



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# APPENDIX A

## IRB APPROVAL



**Human Subjects Office/  
Institutional Review Board (IRB)**

105 Hardin Library for the Health Sciences  
600 Newton Road  
Iowa City, Iowa 52242-1098  
319-335-6564 Fax 319-335-7310  
irb@uiowa.edu  
<http://research.uiowa.edu/hso>

**IRB ID #:** 201501720

**To:** Kari Maurer

**From:** IRB-02 DHHS Registration # IRB00000100,  
Univ. of Iowa, DHHS Federalwide Assurance # FWA00003007

**Re:** A Mixed-Methods Research Perspective of a Technology-Based Behavior Intervention

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**Approval Date:** 03/10/15

**Next IRB Approval  
Due Before:** 02/16/16

**Type of Application:**

- New Project
- Continuing Review
- Modification

**Type of Application Review:**

- Full Board:  
Meeting Date:
- Expedited
- Exempt

**Approved for Populations:**

- Children
- Prisoners
- Pregnant Women, Fetuses, Neonates

Source of Support:

---

This approval has been electronically signed by IRB Chair:  
Brian Bishop, CIP, MA  
03/10/15 1131

OFFICE OF THE VICE PRESIDENT  
FOR RESEARCH

**IRB Approval:** IRB approval indicates that this project meets the regulatory requirements for the protection of human subjects. IRB approval does not absolve the principal investigator from complying with other institutional, collegiate, or departmental policies or procedures.

**Agency Notification:** If this is a New Project or Continuing Review application and the project is funded by an external government or non-profit agency, the original HHS 310 form, "Protection of Human Subjects Assurance Identification/IRB Certification/Declaration of Exemption," has been forwarded to the UI Division of Sponsored Programs, 100 Gilmore Hall, for appropriate action. You will receive a signed copy from Sponsored Programs.

**Recruitment/Consent:** Your IRB application has been approved for recruitment of subjects not to exceed the number indicated on your application form. If you are using written informed consent, the IRB-approved and stamped Informed Consent Document(s) are attached. Please make copies from the attached "masters" for subjects to sign when agreeing to participate. The original signed Informed Consent Document should be placed in your research files. A copy of the Informed Consent Document should be given to the subject. (A copy of the *signed* Informed Consent Document should be given to the subject if your Consent contains a HIPAA authorization section.) If hospital/clinic patients are being enrolled, a copy of the IRB approved Record of Consent form should be placed in the subject's electronic medical record.

**Continuing Review:** Federal regulations require that the IRB re-approve research projects at intervals appropriate to the degree of risk, but no less than once per year. This process is called "continuing review." Continuing review for non-exempt research is required to occur as long as the research remains active for long-term follow-up of research subjects, even when the research is permanently closed to enrollment of new subjects and all subjects have completed all research-related interventions and to occur when the remaining research activities are limited to collection of private identifiable information. Your project "expires" at 12:01 AM on the date indicated on the preceding page ("Next IRB Approval Due on or [Before](#)"). You must obtain your next IRB [approval](#) of this project on or before that expiration date. You are responsible for submitting a Continuing Review application in sufficient time for approval before the expiration date, however the HSO will send a reminder notice approximately 60 and 30 days prior to the expiration date.

**Modifications:** Any change in this research project or materials must be submitted on a Modification application to the IRB for [prior](#) review and approval, except when a change is necessary to eliminate apparent immediate hazards to subjects. The investigator is required to promptly notify the IRB of any changes made without IRB approval to eliminate apparent immediate hazards to subjects using the Modification/Update Form. Modifications requiring the prior review and approval of the IRB include but are not limited to: changing the protocol or study procedures, changing investigators or funding sources, changing the Informed Consent Document, increasing the anticipated total number of subjects from what was originally approved, or adding any new materials (e.g., letters to subjects, ads, questionnaires).

**Unanticipated Problems Involving Risks:** You must promptly report to the IRB any serious and/or unexpected adverse experience, as defined in the UI Investigator's Guide, and any other unanticipated problems involving risks to subjects or others. The Reportable Events Form (REF) should be used for reporting to the IRB.

**Audits/Record-Keeping:** Your research records may be audited at any time during or after the implementation of your project. Federal and University policies require that all research records be maintained for a period of three (3) years following the close of the research project. For research that involves drugs or devices seeking FDA approval, the research records must be kept for a period of three years after the FDA has taken final action on the marketing application.

**Additional Information:** Complete information regarding research involving human subjects at The University of Iowa is available in the "Investigator's Guide to Human Subjects Research." Research investigators are expected to comply with these policies and procedures, and to be familiar with the University's [Federalwide](#) Assurance, the Belmont Report, 45CFR46, and other applicable regulations prior to conducting the research. These documents and IRB application and related forms are available on the Human Subjects Office website or are available by calling 335-6564.

**APPENDIX B:**  
**TEACHER CONSENT**

FOR IRB USE ONLY APPROVED BY: IRB-02 IRB ID #: 201501720 APPROVAL DATE: 02/16/15 EXPIRATION DATE: 02/16/16
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**TEACHER INFORMED CONSENT DOCUMENT**

**Project Title:** A Mixed-Methods Research Perspective of a Technology-Based Behavior Intervention

**Principal Investigator:** Kari Maurer

**Research Team Contact:** Kari Vogelgesang, [kari-maurer@uiowa.edu](mailto:kari-maurer@uiowa.edu), 319-331-0806  
Faculty supervisor, Allison Bruhn, [Allison-bruhn@uiowa.edu](mailto:Allison-bruhn@uiowa.edu), 319-335-5433

This consent form describes the research study to help you decide if you want to participate. This form provides important information about what you will be asked to do during the study, about the risks and benefits of the study, and about your rights as a research subject.

- If you have any questions about or do not understand something in this form, you should ask the research team for more information.
- You should discuss your participation with anyone you choose such as family or friends.
- Do not agree to participate in this study unless the research team has answered your questions and you decide that you want to be part of this study.

**WHAT IS THE PURPOSE OF THIS STUDY?**

This is a research study. We are inviting you to participate in this research study because you are a general education teacher in the Iowa City Community School District and have at least a BA in elementary or secondary education and a current and valid State of Iowa teaching license. You also have a student that is exhibiting a social or behavioral problem in one of your classrooms.

This purpose of this study is to learn how to best support students with social and behavioral difficulties. We hope to find out if students who use a self-monitoring iPad application improve their behavior during class.

**HOW MANY PEOPLE WILL PARTICIPATE?**

Approximately 8 people (up to 5 students and up to 3 teachers) will take part in this study.

**HOW LONG WILL I BE IN THE STUDY?**

If you agree to take part in this study, your involvement will last until the end of the 2015 school year, at the latest. It is possible the study could end earlier, but it will definitely not go past the last day of school. Please note, because the study design involves making decisions about when to implement the intervention based on the student's behavior, it is difficult to estimate the time frame for the entire study. However, we anticipate the entire study will take at least two months to complete. There will be no long-term follow up procedures as part of this study.

**WHAT WILL HAPPEN DURING THIS STUDY?**

1. Prior to collecting any data, you will be asked send a consent letter home with potential student subjects to give to their parents. The letter indicates that observations will be done by the research team in the teacher's classroom and that only data will be collected on students who have assented to participate and whose parents have given parental consent. The research team's contact information is also provided. We ask that the letters be returned no later than 1 week after they are sent home

Page 1 of 5

2. We will meet at an agreed upon time to complete the paper/pencil version of the Strengths and Difficulties Questionnaire (SDQ); Goodman, 1999). The SDQ will be completed without my help and in the privacy of your classroom.
3. At an agreed up time, we will conduct a brief interview with you to gather information regarding your perceptions of the feasibility and sustainability of the self-monitoring iPad app that will be used in your classroom. This interview will be recorded on the PI's password protected iPad. These recordings are optional and if at any time you are uncomfortable with having the interviews recorded, you are encouraged to express your desire to stop the recordings and have them immediately destroyed.
4. After signed parental consent forms are returned and the selected student agrees to participate, the research team will begin to observe and record baseline data on the participating students' academic engagement and disruptive behavior in your classroom. Observations will be non-intrusive as the research team will avoid interaction with any students in the classroom and will sit in an area of your classroom designated by you as practical, feasible, and non-intrusive. The number of days we will be in your classroom to collect baseline data is dependent upon the student's behavior with a minimum of three data points (i.e. 3 days) needed to establish stability or trend. Further, each observation will occur for a maximum of 60 minutes each day.
5. When baseline data for the student subjects is stable or the data are moving in a counter therapeutic direction, I will meet with you and the student separately to explain, model, and practice the self-monitoring app on the iPad. At this time, you will also be asked to complete the pre-intervention social validity questionnaire, which is part of the SDQ. This questionnaire asks questions about the things you anticipate you will or will not like about the intervention. You are free to skip any questions you would prefer not to answer. This meeting will take no more than 1.5 hours to do and will be done at your school.
6. Next, you will implement the self-monitoring app with the student. The intervention involves the student completing the self-monitoring app at the end of every 10-15 minute interval in 1 classroom period, totaling 5-6 intervals in a 60 minute class period. Then, you will complete the same app procedures after each 10-15 minute interval. You will briefly discuss the results of the app ratings with the student at the end of class and discuss the points earned for the class with the goal of the student earning a predetermined number of points (agreed upon by you and researcher in the pre-intervention interview). The researchers will continue to observe and collect behavioral data, with graphing and visual analysis occurring each day to enable experimental decisions to be made. At some point during the study, the app will be taken away to assess what happens to behavior in the absence of the intervention. The removal of the app typically lasts for 3-5 days. The app will be reinstated once the researcher and teacher have had an opportunity to assess performance of behavior, again typically within 3-5 days. If at any time, you feel like you don't want to continue to use the app or if you feel the app isn't working for you, you can ask to stop participating in the study. The number of days for data collection is dependent upon student behavior as demonstrated in graphed data. Again, each observation will occur for a maximum of 60 minutes.
7. Once per week (i.e., every Wednesday) during the course of the study, we will send you a prompt via email to journal about your perceptions of the intervention and how you are interacting with it. These

prompts will include generic questions such as: 'Describe your interactions with the SM app over the last week.' These responses can be any length, should not take a lot of time, and are meant to help the researchers further investigate your perceptions of the intervention. These email journals will be saved and stored in a password protected folder in the researcher's University of Iowa email.

8. At the conclusion of observational data collection, you will be asked to complete a post-intervention social validity questionnaire.

9. At an agreed upon time, we will meet with you again for a post intervention interview. This interview will again focus on your perceptions (feasibility and sustainability) of the SM app intervention. Procedures for the post-intervention interview will be identical to that of the pre-intervention interview in that the interview will be recorded on the researcher's password protected iPad

11. Once all data have been collected and analyzed by the research team, we will meet with you and the student to explain the outcome of the study.

**WHAT ARE THE RISKS OF THIS STUDY?**

There are no known risks to you by participating in this project. To minimize the risk of you feeling like your participation in this study could influence your status at the school, your participation will be kept confidential. If you choose not to participate or if you choose to withdraw from the study, this information will also remain confidential.

If at any time you want to withdraw from the study, we immediately conclude the study and you will not suffer any negative consequences either personally or professionally.

**WHAT ARE THE BENEFITS OF THIS STUDY?**

We do not know if you will benefit from being in this study. We hope this collaborative process will assist teachers in the future support of students with similar behavioral needs. Additionally, we hope the procedures used to support these students will enhance the classroom climate.

**WILL IT COST ME ANYTHING TO BE IN THIS STUDY?**

You will not have any costs associated with being in this study.

**WILL I BE PAID FOR PARTICIPATING?**

You will not be paid for participating in this study.

**WHO IS FUNDING THIS STUDY?**

The University of Iowa and the research team are receiving no payments from other agencies, organizations, or companies to conduct this research study.

**WHAT ABOUT CONFIDENTIALITY?**

We will keep your participation in this research study confidential to the extent permitted by law. However, it is possible that other people such as those indicated below may become aware of your participation in this study and may inspect and copy records pertaining to this research. Some of these records could contain information that personally identifies you.

- federal government regulatory agencies,



- auditing departments of the University of Iowa, and
- the University of Iowa Institutional Review Board (a committee that reviews and approves research studies)

To help protect your confidentiality, we will assign a unique identification number to identify your data. The study identification code will be linked to your name. The list linking your name and your study identification code will be stored in a separate location from the data that is accessible only to the researchers. All records will be maintained in locked filing cabinets or in password protected files on a secure computer system. If we write a report or article about this study or share the study data set with others, we will do so in such a way that you cannot be directly identified.

#### **IS BEING IN THIS STUDY VOLUNTARY?**

Taking part in this research study is completely voluntary. You may choose not to take part at all. If you decide to be in this study, you may stop participating at any time. If you decide not to be in this study, or if you stop participating at any time, you won't be penalized or lose any benefits for which you otherwise qualify.

If you decide to withdrawal from the project, then your student will also be removed from the project. If the student decides to withdraw from the project or does not want to participate in the interview and intervention activities, then he/she will also be removed from the study.

#### **WHAT IF I HAVE QUESTIONS?**

We encourage you to ask questions. If you have any questions about the research study itself, please contact the primary investigator of this study, **Kari Voegesang (319-331-0806)** or the supervising faculty member of this study, **Allison Bruhn (319-335-5433)**.

If you have questions about the rights of research subjects, please contact the Human Subjects Office, 105 Hardin Library for the Health Sciences, 600 Newton Rd, The University of Iowa, Iowa City, IA 52242-1098, (319) 335-6564, or e-mail [irb@uiowa.edu](mailto:irb@uiowa.edu). To offer input about your experiences as a research subject or to speak to someone other than the research staff, call the Human Subjects Office at the number above.

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APPROVAL DATE: 02/16/15  
EXPIRATION DATE: 02/16/16

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This Informed Consent Document is not a contract. It is a written explanation of what will happen during the study if you decide to participate. You are not waiving any legal rights by signing this Informed Consent Document. Your signature indicates that this research study has been explained to you, that your questions have been answered, and that you agree to take part in this study. You will receive a copy of this form.

Subject's Name (printed): \_\_\_\_\_

**Do not sign this form if today's date is on or after** EXPIRATION DATE: 02/16/16 .

\_\_\_\_\_  
(Signature of Subject)

\_\_\_\_\_  
(Date)

**Statement of Person Who Obtained Consent**

I have discussed the above points with the subject or, where appropriate, with the subject's legally authorized representative. It is my opinion that the subject understands the risks, benefits, and procedures involved with participation in this research study.

\_\_\_\_\_  
(Signature of Person who Obtained Consent)

\_\_\_\_\_  
(Date)

## APPENDIX C

### PARENT CONSENT FORM

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IRB ID #: 201501720  
APPROVAL DATE: 02/16/15  
EXPIRATION DATE: 02/16/16

#### INFORMED CONSENT DOCUMENT

**Project Title:** A Mixed-Methods Research Perspective of a Technology-Based Behavior Intervention

**Principal Investigator:** Kari Vogelgesang

**Research Team Contact:** Kari Vogelgesang  
PhD Candidate, Special Education  
[Kari-maurer@uiowa.edu](mailto:Kari-maurer@uiowa.edu)  
319-331-0806

- If you are the parent/guardian of a child under 18 years old who is being invited to be in this study, the word "you" in this document refers to your child. You will be asked to read and sign this document to give permission for your child to participate.

This consent form describes the research study to help you decide if you want to participate. This form provides important information about what you will be asked to do during the study, about the risks and benefits of the study, and about your rights as a research subject.

- If you have any questions about or do not understand something in this form, you should ask the research team for more information.
- You should discuss your participation with anyone you choose such as family or friends.
- Do not agree to participate in this study unless the research team has answered your questions and you decide that you want to be part of this study.

#### **WHAT IS THE PURPOSE OF THIS STUDY?**

This is a research study. We are inviting you to participate in this research study because you have been nominated by your teacher as someone who may benefit from learning how to self-monitor your classroom behavior.

The purpose of this research study is to learn how to help students with behavioral difficulties. We hope to find out if students who use a self-monitoring iPad application improve their behavior during class.

#### **HOW MANY PEOPLE WILL PARTICIPATE?**

Approximately 8 people (5 students and 3 teachers) will take part in this study at Horace Mann Elementary School in Iowa City, Iowa.

#### **HOW LONG WILL I BE IN THIS STUDY?**

If you agree to take part in this study, your involvement will last until the end of the 2015 school year, at the latest. It is possible the study could end earlier, but it will definitely not go past the last day of school. Please note, because the study design involves making decisions about when to implement the intervention based on the student's behavior, it is difficult to estimate the time frame for the entire study. However, we anticipate the entire study will take at least two months to complete. There will be no long-term follow up procedures as part of this study.

#### **WHAT WILL HAPPEN DURING THIS STUDY?**

1. At your school, the researchers will observe you in one of your classrooms for a maximum of 60 minutes per day for a maximum of 5 days per week. The minimum number of days you will be observed is 15 days. The researchers will be recording baseline data (i.e., data recorded prior to the start of the second phase of the study) about your behaviors in the classroom. The observers will not interact with you or with any other students in the classroom and will sit in a location in the classroom that is practical and the least disruptive to the class.
2. After collecting and reviewing the baseline data, the researcher will meet with you and your teacher to explain and practice the self-monitoring application (SM App) on an iPad that you will complete during the second phase of the study. Also at this time, you will be asked to complete a questionnaire that asks about your opinion about the iPad SM App. You are free to skip any questions you would prefer not to answer. This meeting will take no more than 1.5 hours to do and will be done at your school.
4. You and your teacher will then be asked to use the SM App on a daily basis. You will complete the SM App and then ask your teacher to complete the same SM App and discuss it at the end of each 10-15 minute interval during class (i.e., The SM App will ask you to rate your behavior during the previous 10-15 interval and will take no longer than 1 minute each time. The researchers will continue to observe and collect data about you in the classroom during this time. Again, each observation will last for a maximum of 60 minutes/day while you are at school. The rating of your behavior on the iPad will end once data for all participants has been collected. At some point during the study, the app will be taken away to assess what happens to behavior in the absence of the intervention. The removal of the app typically lasts for 3-5 days. The app will be reinstated once the researcher and teacher have had an opportunity to assess performance of behavior, again typically within 3-5 days. If at any time, you feel like you don't want to continue to use the app or if you feel the app isn't working for you, you can ask to stop participating in the study.
5. At the end of data collection, you will be asked to complete the same questionnaire as before that asks your opinions about the iPad SM App. You are free to skip any questions you prefer not answer. This will take about 25 minutes and will be done at school. Your teacher will provide us with your most recent Scholastic Reading Inventory (SRI) score and number of office discipline referrals.
6. At the end of the study, we will meet with you and your teacher to explain what we found out during the study. This will take about 20 minutes and will be done at school.

#### **WHAT ARE THE RISKS OF THIS STUDY?**

You may experience one or more of the risks indicated below from being in this study. In addition to these, there may be other unknown risks, or risks that we did not anticipate, associated with being in this study.

You will be spending some extra time thinking about how you feel you are doing in the classroom and then talking about this with your teacher. As a result, your classmates may see you getting extra attention from the teacher.

You also may feel uncomfortable being observed by the researchers in class. We will not single you out from other students during our observations and you may ask us to end the observations at any time.

**WHAT ARE THE BENEFITS OF THIS STUDY?**

We don't know if you will benefit from being in this study. However, we hope that, in the future, other people might benefit from this study because it may show teachers how they can help students who need extra support to improve their behavior and be successful in reading.

**WILL IT COST ME ANYTHING TO BE IN THIS STUDY?**

You will not have any costs for being in this research study.

**WILL I BE PAID FOR PARTICIPATING?**

You will not be paid for being in this research study.

**WHAT ABOUT CONFIDENTIALITY?**

We will keep your participation in this research study confidential to the extent permitted by law. However, it is possible that other people such as those indicated below may become aware of your participation in this study and may inspect and copy records pertaining to this research. Some of these records could contain information that personally identifies you.

- federal government regulatory agencies,
- auditing departments of the University of Iowa, and
- the University of Iowa Institutional Review Board (a committee that reviews and approves research studies)

To help protect your confidentiality, we will use only your first name on forms completed at your school. Then, once the forms have been brought to the University of Iowa, we will assign a unique identification number to your data. The number will be the way to identify you and your first name will then be removed from all forms. The link between your first name and your unique ID number will be stored separately from study data in a locked file that is accessible only to the research team. We will transport all study materials from your school to the University of Iowa in secure containers. We will store all paper materials in locked file-cabinets and all electronic records in password protected computer files. If we write a report or article about this study or share the study data set with others, we will do so in such a way that you cannot be directly identified.

**IS BEING IN THIS STUDY VOLUNTARY?**

Taking part in this research study is completely voluntary. You may choose not to take part at all. If you decide to be in this study, you may stop participating at any time. If you decide not to be in this study, or if you stop participating at any time, you won't be penalized or lose any benefits for which you otherwise qualify

**WHAT IF I HAVE QUESTIONS?**

We encourage you to ask questions. If you have any questions about the research study itself, please contact: Kari Vogelgesang (319-331-0806) or Allison Bruhn, the supervising faculty of this study, (319-335-5433).

If you have questions, concerns, or complaints about your rights as a research subject or about research

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related injury, please contact the Human Subjects Office, 105 Hardin Library for the Health Sciences, 600 Newton Rd, The University of Iowa, Iowa City, IA 52242-1098, (319) 335-6564, or e-mail [irb@uiowa.edu](mailto:irb@uiowa.edu). General information about being a research subject can be found by clicking "Info for Public" on the Human Subjects Office web site, <http://hso.research.uiowa.edu/>. To offer input about your experiences as a research subject or to speak to someone other than the research staff, call the Human Subjects Office at the number above.

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This Informed Consent Document is not a contract. It is a written explanation of what will happen during the study if you decide to participate. You are not waiving any legal rights by signing this Informed Consent Document. Your signature indicates that this research study has been explained to you, that your questions have been answered, and that you agree to take part in this study. You will receive a copy of this form.

Subject's Name (printed): \_\_\_\_\_

Parent/Guardian Name and Relationship to Subject:

\_\_\_\_\_  
(Name - printed)

\_\_\_\_\_  
(Relationship to Subject - printed)

**Do not sign this form if today's date is on or after EXPIRATION DATE: 02/16/16 .**

\_\_\_\_\_  
(Signature of Parent/Guardian)

\_\_\_\_\_  
(Date)

## APPENDIX D:

### STUDENT ASSENT

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#### ASSENT DOCUMENT

**Project Title: A Mixed-Methods Research Perspective of a Technology-Based Behavior Intervention**

**Investigator(s): Kari Maurer, MA**

We are doing a research study. A research study is a special way to find out about something. We are trying to find out if using a special app on an iPad can help students behave better in the classroom.

If you decide that you want to be in this study, this is what will happen. We will sit in your classroom and watch you for up to about an hour each day a few times a week for a couple of weeks. We will not disturb you or your classmates when we sit in your classroom. We will be looking at what you are doing in the classroom and writing notes about what we see.

After we have sat in your classroom for a few days, we will meet with you and your teacher to show you how to use an app on an iPad to do a checklist that rates your behavior. You will fill out this checklist every 10-15 minutes during one of your classes. The checklist has 4 questions and will take 20-30 seconds to do each time. Your teacher will also use the iPad to rate your behavior and will talk about those ratings with you. The iPad app will add up your points each day and show you a graph of how you are doing. Your teacher may reward you for earning a certain number of points. We will still sit in your classroom and watch you during the time you are using the iPad. When we are done sitting in your classroom, the study will be over. Before you start to use the iPad app and then again at the end of the study, we will ask you to fill out a questionnaire about using the app on the iPad. At the end of the study, we will meet with you and your teacher to explain what we found out during the study. This will take about 20 minutes and will be done at school.

We want to tell you about some things that might hurt or upset you if you are in this study. You will be spending some extra time thinking about how you feel you are doing in the classroom and then talking about this with your teacher. Other students in the class may see you getting extra attention from your teacher. You may stop being in the study at any time. Also, whether or not you do this study will not affect your grade in the class. You will not have to do extra class assignments or take extra classes for the study.

We don't know if being in this research study will help you. But we hope to learn something that will help other people someday.

When we are done with the study, we will write a report about what we found out. We won't use your name in the report.

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You don't have to be in this study. It's up to you. If you say okay now, but you change your mind later, that's okay too. All you have to do is tell us.

If you want to be in this study, please sign or print your name.

I, \_\_\_\_\_, want to be in this research study.  
(Child's name)

\_\_\_\_\_  
(Sign or print your name here)

\_\_\_\_\_  
(Date)



## APPENDIX E:

### SDQ

#### Strengths and Difficulties Questionnaire

T 11-17

For each item, please mark the box for Not True, Somewhat True or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain. Please give your answers on the basis of this student's behavior over the last six months or this school year.

Student's name ..... Male/Female

Date of birth.....

	Not True	Somewhat True	Certainly True
Considerate of other people's feelings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Restless, overactive, cannot stay still for long	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often complains of headaches, stomach-aches or sickness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shares readily with other youth, for example pencils, books, food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often loses temper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Would rather be alone than with other youth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Generally well behaved, usually does what adults request	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Many worries or often seems worried	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Helpful if someone is hurt, upset or feeling ill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Constantly fidgeting or squirming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has at least one good friend	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often fights with other youth or bullies them	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often unhappy, depressed or tearful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Generally liked by other youth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Easily distracted, concentration wanders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nervous in new situations, easily loses confidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kind to younger children	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often lies or cheats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Picked on or bullied by other youth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Often offers to help others (parents, teachers, children)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Thinks things out before acting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Steals from home, school or elsewhere	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gets along better with adults than with other youth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Many fears, easily scared	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Good attention span, sees work through to the end	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Do you have any other comments or concerns?

**Please turn over - there are a few more questions on the other side**

Overall, do you think that this student has difficulties in any of the following areas:  
emotions, concentration, behavior or being able to get on with other people?

	No	Yes- minor difficulties	Yes- definite difficulties	Yes- severe difficulties
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If you have answered "Yes", please answer the following questions about these difficulties:

- How long have these difficulties been present?

	Less than a month	1-5 months	6-12 months	Over a year
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Do the difficulties upset or distress this student?

	Not at all	Only a little	A medium amount	A great deal
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Do the difficulties interfere with this student's everyday life in the following areas?

	Not at all	Only a little	A medium amount	A great deal
PEER RELATIONSHIPS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CLASSROOM LEARNING	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Do the difficulties put a burden on you or the class as a whole?

	Not at all	Only a little	A medium amount	A great deal
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Signature .....

Date .....

## APPENDIX F

### Whole-Interval Recording System

#### SM App Direct Observation Form (Horn)

Date: \_\_\_\_\_ Observer: \_\_\_\_\_ IOA Observer: \_\_\_\_\_

Student ID: \_\_\_\_\_ BL or IV

Int.	Time	AE
1	:20	
2	1:20	
3	2:20	
4	3:20	
5	4:20	
6	5:20	
7	6:20	
8	7:20	
9	8:20	
10	9:20	
11	10:20	
12	11:20	
13	12:20	
14	13:20	
15	14:20	
16	15:20	
17	16:20	
18	17:20	
19	18:20	
20	19:20	
21	20:20	
22	21:20	
23	22:20	
24	23:20	
25	24:20	
26	25:20	
27	26:20	
28	27:20	
29	28:20	
30	29:20	

Student ID: \_\_\_\_\_ BL or IV

Int.	Time	AE
1	:40	
2	1:40	
3	2:40	
4	3:40	
5	4:40	
6	5:40	
7	6:40	
8	7:40	
9	8:40	
10	9:40	
11	10:40	
12	11:40	
13	12:40	
14	13:40	
15	14:40	
16	15:40	
17	16:40	
18	17:40	
19	18:40	
20	19:40	
21	20:40	
22	21:40	
23	22:40	
24	23:40	
25	24:40	
26	25:40	
27	26:40	
28	27:40	
29	28:40	
30	29:40	

Student ID: \_\_\_\_\_ BL or IV

Int.	Time	AE
1	1:00	
2	2:00	
3	3:00	
4	4:00	
5	5:00	
6	6:00	
7	7:00	
8	8:00	
9	9:00	
10	10:00	
11	11:00	
12	12:00	
13	13:00	
14	14:00	
15	15:00	
16	16:00	
17	17:00	
18	18:00	
19	19:00	
20	20:00	
21	21:00	
22	22:00	
23	23:00	
24	24:00	
25	25:00	
26	26:00	
27	27:00	
28	28:00	
29	29:00	
30	30:00	

## APPENDIX G

### Treatment Fidelity Checklist

Date: \_\_\_\_\_

Observer: \_\_\_\_\_

#### Self-Monitoring App: Treatment Fidelity Checklist

Student ID: \_\_\_\_\_

Component	10 minutes	20 minutes	30 minutes	40 minutes	60 minutes
1. Did the student rate him/herself using the SM App?					
2. Did the teacher rate the target student using the SM App?					
End of Class					
3. Did the student review their PPB goal?					

Notes:

## APPENDIX H

### Intervention Rating Profile

Teacher Version

Intervention Rating Profile-15

Post-Intervention

(Adapted Version)

Directions: Circle the number which best describes your agreement or disagreement with each statement

#	Statement	Strongly disagree	Disagree	Slightly agree	Slightly disagree	Agree	Strongly agree
1	This was an acceptable intervention for the student's problem behavior.						
2	Most teachers would find this intervention appropriate for behavior.						
3	This intervention was effective in changing the child's problem behavior.						
4	I would suggest use of this intervention to other teachers.						
5	The child's behavior problem was severe enough to warrant use of this intervention.						
6	Most teachers would find this intervention suitable for the behavior problem described.						
7	I would be willing to use this intervention in the classroom setting again.						
8	This intervention did not result in negative side-effects for the child.						
9	This intervention would be appropriate for a variety of children.						
10	This intervention was consistent with those I have used in classroom settings.						
11	The intervention was a fair way to handle the child's problem behavior.						
12	This intervention was reasonable for the behavior problem described.						
13	I liked the procedures used in this intervention.						
14	This intervention was a good way to handle this child's behavior problem.						
15	Overall, this intervention was beneficial for the child.						

Open-ended questions:

1. What did you like most about using the app?

Teacher Version

Intervention Rating Profile-15  
(Adapted Version: Continued)

Post-Intervention

2. What did you like least about using the app?
  
  
  
  
  
  
  
  
  
  
3. Is there anything you would change about the app? If so, what?
  
  
  
  
  
  
  
  
  
  
4. Additional comments:

## APPENDIX I

### Semi-structured interview guide

Main Question	Additional Questions	Clarifying Questions
<ul style="list-style-type: none"> <li>• Can you tell me about your experience with using technology in your classroom?</li> </ul> <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> <li>• Have you ever used technology to help with a behavioral or academic intervention before this study?</li> </ul>	<ul style="list-style-type: none"> <li>• What kind of training have you had with using technology in your classroom?</li> <li>• What types of issues, if any, have you experienced with using technology in your classroom? Specifically for an intervention.</li> </ul>	<ul style="list-style-type: none"> <li>• Can you expand on this a little more?</li> <li>• Can you tell me anything else?</li> <li>• Can you give me some examples?</li> </ul>
<ul style="list-style-type: none"> <li>• What types of technology issues do you anticipate or did you experience when using SCORE IT in your classroom?</li> </ul>	<ul style="list-style-type: none"> <li>• Do you anticipate or did you experience any internet issues?</li> <li>• Do you anticipate or did you experience any application glitches?</li> </ul>	<ul style="list-style-type: none"> <li>• Can you expand on this a little more?</li> <li>• Can you tell me anything else?</li> <li>• Can you give me some examples?</li> </ul>
<ul style="list-style-type: none"> <li>• What types of logistical issues do you anticipate or did you experience when using SCORE IT in your classroom?</li> </ul>	<ul style="list-style-type: none"> <li>• Was the iPad easily accessible for both student and teacher?</li> <li>• Was it difficult to keep track of the iPad?</li> <li>• Would it work better if both the teacher and student had their own iPad?</li> </ul>	<ul style="list-style-type: none"> <li>• Can you expand on this a little more?</li> <li>• Can you tell me anything else?</li> <li>• Can you give me some examples?</li> </ul>
<ul style="list-style-type: none"> <li>• Do you have any concerns about engaging in brief conversations with the participating students regarding the scores recorded in the app between intervals?</li> </ul>	<ul style="list-style-type: none"> <li>• Did you have enough time?</li> <li>• Did it interrupt instruction?</li> <li>• Did the student ever challenge you regarding your score?</li> <li>• Did it take away attention from other students?</li> <li>• Was it difficult to have these conversations? If yes, in what ways?</li> </ul>	<ul style="list-style-type: none"> <li>• Can you expand on this a little more?</li> <li>• Can you tell me anything else?</li> <li>• Can you give me some examples?</li> </ul>
<ul style="list-style-type: none"> <li>• If you could change anything about the intervention, what would it be?</li> </ul>	<ul style="list-style-type: none"> <li>• Any technical components you would like to change?</li> <li>• Would you change the implementation procedures? If yes, which ones and why?</li> <li>• Would you keep the student/teacher discussion between rotations?</li> </ul>	<ul style="list-style-type: none"> <li>• Can you expand on this a little more?</li> <li>• Can you tell me anything else?</li> <li>• Can you give me some examples?</li> </ul>
<ul style="list-style-type: none"> <li>• Generally speaking, do you feel SCORE IT could be used independently by classroom teachers?</li> </ul>	<ul style="list-style-type: none"> <li>• How much training would a teacher need to use this intervention?</li> <li>• Specifically what would need to be included in the training?</li> </ul>	<ul style="list-style-type: none"> <li>• Can you expand on this a little more?</li> <li>• Can you tell me anything else?</li> <li>• Can you give me some examples?</li> </ul>

## APPENDIX J

### Transcription protocol

A Mixed Methods Study of SCORE IT: A Technology Based Self-Monitoring Intervention  
Transcription

**Interviewer:**  
**Interviewee:**  
**Date:**  
**Location:**

Question and Response	Notes
1. <b>Can you tell me about your experience using</b> 2. <b>technology in your classroom?</b> 3. Teacher response 4. <b>Have you ever used technology to help with a</b> 5. <b>behavioral or academic intervention before this</b> 6. <b>study?</b> 7. Teacher response 8. <b>What types of technology issues do you anticipate</b> 9. <b>or did you</b> 10. <b>experience when using SCORE IT in your</b> 11. <b>classroom?</b> 12. Teacher response 13. <b>What types of logistical issues do you anticipate or</b> 14. <b>did you</b> 15. <b>experience when using SCORE IT in your</b> 16. <b>classroom?</b> 17. Teacher response 18. <b>What kind of training have you had with using</b> 19. <b>technology in your classroom?</b>	

#### Transcription Protocol:

1. Inclusion of identifying information of the interview at the top of each page (when, where, who)
2. Line numbering down the left-hand side of the page
3. Interview questions bolded
4. Wide margin on the right-hand side of the page for additional notes or codes



## APPENDIX K

### Email Journal Prompts

**Journal #1:** *Have you ever used a self-monitoring intervention in your classroom? If yes, please give as much detail as possible about the intervention you used and your experience with it. Also, have you ever used technology with a self-monitoring intervention?*

**Journal #2:** *What are your expectations with regards to how SCORE IT will impact student behavior? What kinds of difficulties have you experienced with the intervention?*

**Journal #3:** *Tell me a story about using the app. In other words, describe an experience that you have had with SCORE IT.*

**Journal #4:** *Tell me what you liked the most about using SCORE IT and what you would like to change about the intervention.*

## APPENDIX L

### Data Collection Timeline

#### A Mixed Methods Research Perspective of a Technology-Based Self-Monitoring Intervention

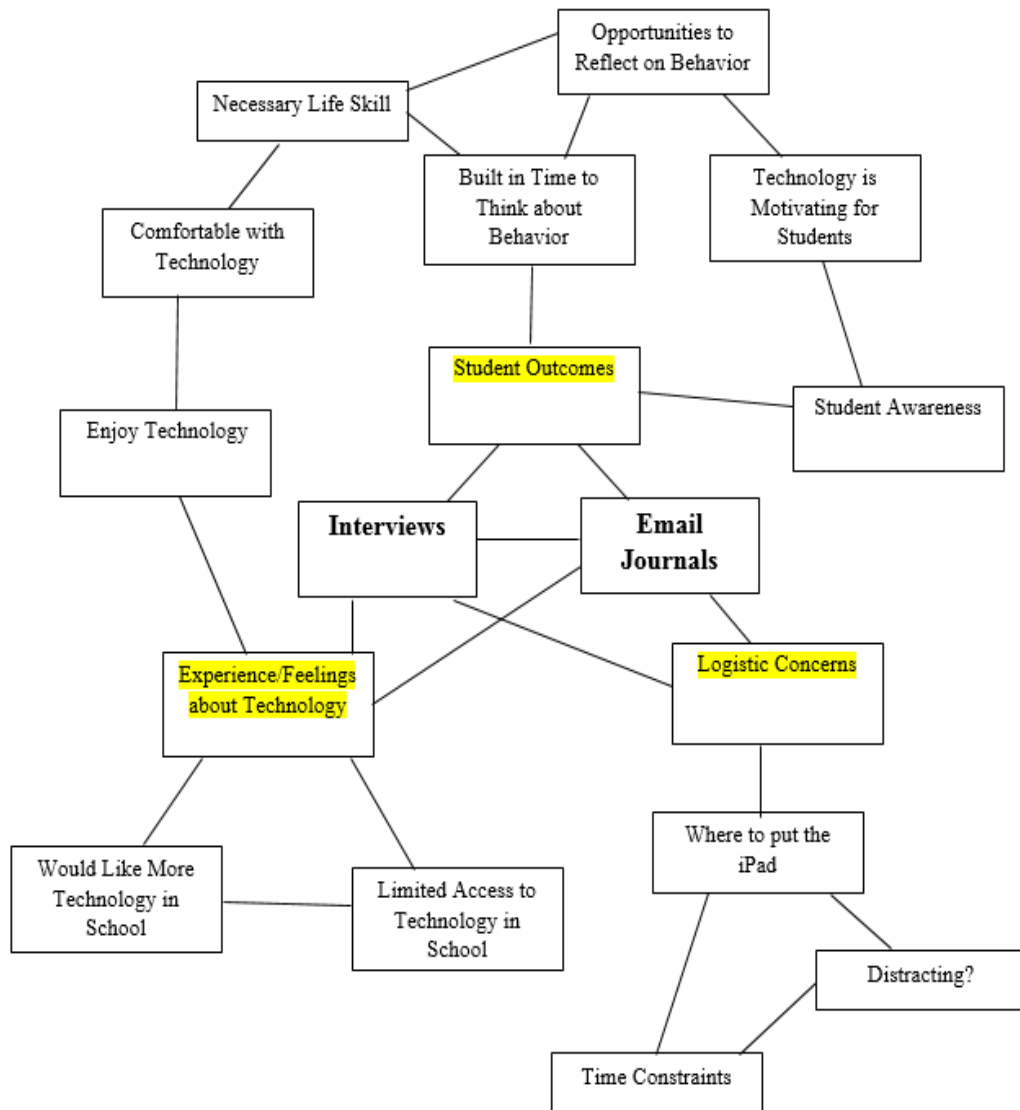
#### Data Collection Timeline

<b>Date</b>	<b>Data Source</b>
February 17, 2015	Gave teacher SDQ to complete for all three student participants
February 20, 2015	Obtained and calculated teacher completed SDQ
February 23, 2015	Pre-intervention interview was conducted
February 24, 2015	Pre-intervention interview as transcribed and coded
February 25, 2015	Direct observation of behavior data collection began: John (A1)
February 25, 2015	1 <sup>st</sup> email prompt was sent to the teacher
February 25, 2015	Calculated and graphed behavior data
February 25, 2015	1 <sup>st</sup> email journal was coded
March 2, 2015	Direct observation of behavior data collection: 2nd day of phase A1 for John and 1st day of phase A1 for Emily and Ashley
March 2, 2015	Calculated and graphed behavior data
March 3, 2015	Direct observation of behavior data collection: 3 <sup>rd</sup> day of phase A1 for John and 2nd day of phase A1 for Emily and Ashley
March 3, 2015	Calculated and graphed behavior data
March 4, 2015	2 <sup>nd</sup> Email journal was sent to the teacher
March 5, 2015	2 <sup>nd</sup> Email journal was coded
March 5, 2015	Direct observation of behavior data collection: 1st day of phase B1 for John and 3rd day of phase A1 for Emily and Ashley
March 5, 2015	Calculated and graphed behavior data
March 6, 2015	Direct observation of behavior data collection: John was sick, 4 <sup>th</sup> day of phase A1 for Emily and Ashley
March 6, 2015	Calculated and graphed behavior data
March 10, 2015	Direct observation of behavior data collection: 2 <sup>nd</sup> day of phase B1 for John and 1st day of phase B1 for Emily and Ashley
March 10, 2015	Calculated and graphed behavior data
March 11, 2015	Direct observation of behavior data collection: 3rd day of phase B1 for John and 2nd day of phase B1 for Emily and Ashley
March 11, 2015	3 <sup>rd</sup> Email Journal was sent to the teacher
March 11, 2015	Calculated and graphed behavior data
March 11, 2015	3 <sup>rd</sup> email journal was coded

March 12, 2015	Direct observation of behavior data collection: 1st day of phase A2 for John and 3rd day of phase B1 for Emily and Ashley
March 12, 2015	Calculated and graphed behavior data
March 13, 2015	Direct observation of behavior data collection: 2 <sup>nd</sup> day of phase A2 for John and 1st day of phase A2 for Emily and Ashley
March 13, 2015	Calculated and graphed behavior data
March 16, 2015	Worked on translating codes into themes
March 17, 2015	Worked on translating codes into themes
March 23, 2015	Direct observation of behavior data collection: 3rd day of phase A2 for John and 2nd day of phase A2 for Emily and Ashley
March 23, 2015	Calculated and graphed behavior data
March 24, 2015	Direct observation of behavior data collection: 4th day of phase A2 for John and 3rd day of phase A2 for Emily and Ashley
March 24, 2015	Calculated and graphed behavior data
March 25, 2015	Direct observation of behavior data collection: 1 <sup>st</sup> day of phase B2 for John and 1 <sup>st</sup> day of phase A2 for Emily and Ashley
March 25, 2015	Calculated and graphed behavior data
March 25, 2015	4 <sup>th</sup> email journal was sent to the teacher
March 25, 2015	4 <sup>th</sup> email journal was coded
March 25, 2015	Gave the teacher the IRP-15 to complete
March 25, 2015	Skype meeting with Coghill-Behrends – peer review process
March 26, 2015	Direct observation of behavior data collection: 2 <sup>nd</sup> day of phase B2 for John and 2nd day of phase B2 for Emily and Ashley
March 26, 2015	Calculated and graphed behavior data
March 26, 2015	Scored IRP-15
March 26, 2015	Conducted post-intervention teacher interview
March 26, 2015	Transcribed and coded teacher interview
March 26, 2015	Updated theme map/development
March 27, 2015	Direct observation of behavior data collection: 3rd day of phase B2 for John and 3rd day of phase B2 for Emily and Ashley
March 27, 2015	Calculated and graphed behavior data
March 27, 2015	In person meeting with Coghill-Behrends – peer review process

## APPENDIX M

### Visual Theme Map



## **APPENDIX N**

### **Peer Review Process**

My peer reviewer, Mr. Coghill-Behrends, was the director of a pre and in-service teacher professional development center in the college of education at the University of Iowa. Mr. Coghill-Behrends had 15 years of classroom teaching experience at both the secondary and post-secondary level. He had experience/knowledge of self-monitoring interventions and working with students with emotional and behavioral disorders, however he was not formally trained or educated in this line of research. Coghill-Behrends had been a part of several qualitative research studies and was in the process of conducting his own Ph.D. dissertation in foreign language education using qualitative methodology.

#### **March 5, 2015**

Initially, I wanted Mr. Coghill-Behrends to look through the beginnings of the data I had collected to verify I was transcribing and coding the data in a way that accurately and consistently. I gave Mr. Coghill-Behrends the transcriptions of the pre-intervention interview and the first two email journals and asked him to examine my work. The following day, Coghill-Behrends communicated that as far as he could tell, my transcriptions and themes appeared to be accurate and logical. At this point, he suggested we meet again, once I had all of the data gathered, to spend time together analyzing and discussing the data and how it connects to the goals of my research.

#### **March 27, 2015**

Three weeks later, Coghill-Behrends and I met in person to examine nearly all of the qualitative data I had collected throughout the study. This included: the pre-intervention interview, all four email journals, and the post-intervention interview. It took us approximately 1.5 hours to review and discuss this data. Details concerning the items discussed and analyzed are listed below:

1. Overview of the study including a reading of the abstract and research questions.
2. Coghill-Behrends review of all the raw data without my codes. At this time, he provided his own codes to the data.
3. Compared and contrasted his codes with the codes I had provided to the transcripts. With the exception of minor word variations, our codes matched nearly 100%.
  - a. Differences in word/coding choices: experience/involvement, practice/rehearse, utility/operations.
4. Coghill-Behrends examined my working theme maps and suggested I start condensing these maps into one visual. The visual that was created from this suggestions in Figure 8 (theme development map).

Overall, after reviewing the operational definitions of the codes and my interruption of the data, Coghill-Behrends came to understand how I was analyzing the data and communicated that he felt my coding and theme development was accurate and consistent throughout.