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The effects of real-time visual performance feedback on teacher feedback.

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THE EFFECTS OF REAL-TIME VISUAL PERFORMANCE FEEDBACK ON
TEACHER FEEDBACK

By

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B.A., Trinity Lutheran College, 2007
M.A., University of Louisville, 2011

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A Dissertation Approved on

April 20, 2015

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DEDICATION

This dissertation is dedicated to my family

Gina, Noah, and Alvin

who are special gifts in my life.

ACKNOWLEDGMENTS

Completing this dissertation is the fulfillment of a long-time personal dream and a goal I was not sure I would have the opportunity to accomplish. Many people offered support and played important roles in my life before and during—and hopefully after—this process. Thank you to my family, friends, colleagues, and mentors from past and present who have given me so much to help me get here and to shape me not just into a better doctoral student but a better person.

First thanks go to my wife, Gina, who made many sacrifices to go down this path with me. You make my life shine with meaning, and through you in so many ways God has made me a better person, husband, father than I believed possible. Thank you for sharing life with me and for being family, someone to whom and through whom I will always belong. Thank you for raising Noah and Alvin together with me. And I'm so thankful for Noah, how you give me reasons to laugh and smile and to work harder and better and more efficiently; in so many ways, having you during this time made life—and even my dissertation—better and more meaningful.

I would also like to thank our family for all of their support. Thank you to my parents for instilling in me a love of reading and learning and for encouraging me to pursue my doctorate despite the risks and challenges. And thank you to Glenda for being such a loving grandmother and mom and for pouring into our lives; even now as I finish writing, you are helping Gina care for Noah, loving them both and me so well.

ABSTRACT

THE EFFECTS OF REAL-TIME VISUAL PERFORMANCE FEEDBACK ON
TEACHER FEEDBACK

Chris A. Sweigart

April 20, 2015

Researchers have identified a number of instructional strategies as evidence-based
for improving the academic and behavioral outcomes of students. However, teachers
often do not employ these practices or rarely implement them at recommended rates,
perpetuating a research-to-practice gap. Further, research has demonstrated that
traditional professional development is often insufficient to change teacher practice;
therefore, researchers have explored a number of interventions to supplement teacher
training. Performance feedback is one such method that has a growing base of empirical
evidence. This study explored the effects of visual performance feedback (VPF)
delivered in real-time using screen sharing technology on a discrete teacher practice (i.e.,
positive feedback) for four general education teachers in a middle school using a multiple
baseline across teachers design. Additionally, I examined whether changes in teachers'
use of positive feedback had collateral effects on their use of negative feedback and on
targeted students' engagement levels and disruptive behavior. While training alone was
insufficient to produce notable change in teacher practice, the addition of real-time VPF
generally led to teachers increasing their use of positive feedback while maintaining

stable and low rates of negative feedback. Student behavior did not appear to have a direct relationship with changes in teacher practice.

Results of this study suggests that real-time VPF may be an effective intervention for teacher behavior change. Real-time VPF warrants further study, including additional replications and studies that incorporate more sophisticated designs with larger samples. While a number of effective practices have been identified that positively affect student outcomes, many of them have yet to be consistently translated into practice in applied settings. Therefore, continued studies of similar interventions that target lasting teacher behavior change (e.g., performance feedback, coaching) are critical to the improvement of practice.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

National attention is currently focused on teacher quality, with increasing calls for greater teacher evaluation and accountability for student outcomes (see Ingersoll, 2011). With this increased attention and pressure, multiple developments have emerged. Policymakers have implemented competitive funding programs that require states to evaluate teachers, often using their students' standardized test scores (e.g., Race to the Top; McGuinn, 2012). Foundations have funded large scale studies using value-added measures to develop measures of teacher quality to identify effective and ineffective teachers using information derived from a wide variety of sources, such as direct classroom observations, pedagogical content knowledge and subject-area knowledge tests, and surveys (e.g., Measures of Effective Teaching project; Kane, McCaffrey, Miller, & Staiger, 2013). Researchers have called for the use of standardized observation and evaluation systems to assess characteristics and practices of effective teachers (e.g., Pianta & Hamre, 2009), and various relevant tools have been developed, such as the Framework for Teaching (Danielson, 2007) and the Classroom Assessment Scoring System (Pianta, La Paro, & Hamre, 2008). One result of these interrelated policy and research initiatives has been the development of momentum toward the goal of enhancing teacher quality and, subsequently, improving student achievement.

Statement of the Problem

Teacher Practice. The growing national emphasis on assessing teacher quality rests on one critical premise: teachers, and what they do, matter. Indeed, perhaps no other factor is more influential upon the short- and long-term success of students than their teachers (Nye, Konstantopoulos, & Hedges, 2004; Stronge, Ward, & Grant, 2011). Compared to their lower performing colleagues, high performing teachers can effect gains in student learning and achievement of one-third to one-half of a standard deviation in reading and mathematics, respectively (Nye et al., 2004; Stronge et al., 2013). Further, the effects such teachers have on student success can persist for years; for example, a highly effective first grade teacher can have a significant impact on students' achievement scores through the sixth grade (Konstantopoulos & Chung, 2011). Thus, even one highly effective teacher can benefit students for many years. Similarly, ineffective teachers can have detrimental effects on their students, especially when students have such teachers for consecutive years. Because teachers who use instructional practices to actively engage students in instruction and promote positive learning climates can have such a large, and potentially cumulative impact on student achievement (Allen et al., 2013), it is critical that teachers employ the most effective practices available.

One of the markers of effective practice that is most likely to improve the prospect of students' academic, behavioral, and social success is maximizing the amount of time students spend actively engaged in instruction (Brophy & Good, 1986; Rosenshine & Berliner, 1978). Students who spend more time actively engaged are much more likely to master the content at hand (Brophy, 1988). Teachers maintain high

levels of engagement in instructional content by implementing effective instructional and classroom management practices that minimize disruptions, down-time, and transitions, and maximize opportunities for students to participate. A number of practices have been identified that help maintain high rates of engagement; examples include the use of clear expectations (Scott, Anderson, & Alter, 2012), modeling (Rosenshine, 1995), opportunities to respond (Stichter et al., 2009), and positive feedback (Hattie & Timperley, 2007).

Positive feedback is a particularly effective practice for shaping students' academic and behavioral performance, and multiple researchers consider it to be an evidence-based practice for a wide variety of students (e.g., Lewis, Hudson, Richter, & Johnson, 2004; Simonsen, Fairbanks, Briesch, Myers, & Sugai, 2008). Positive feedback to students regarding their academic or behavioral performance can be an effective tool to impact a variety of student outcomes. Positive feedback consists of teacher verbal responses to student academic or social behavior, including statements affirming that a student response is accurate and/or acceptable (Hirn, 2011). In a meta-analysis of feedback covering 196 studies, Hattie and Timperley (2007) found that feedback had a powerful effect on student achievement. With an average effect size of 0.79, feedback had nearly double the average effect of typical school practices (0.40). Furthermore, research findings have supported a strong, positive correlation between teacher rate of positive feedback and student academic engagement (Allday et al., 2012). Researchers have recommended maintaining relatively high rates of positive feedback, with three or four positive feedback statements for every one negative (Scott et al., 2012; Stichter et al., 2009; Trussell, 2008).

Research-to-practice gap. Despite the identification of effective, evidence-based practices, there is a disconnect between the knowledge base and practice in schools (Biesta, 2007; Broekkamp & van Hout-Woulters, 2007; Korthagen, 2007). This is a common concern among researchers wherein the evidence base continues to grow through education research while the application of this knowledge in schools does not (Grima-Farrell, Bain, & McDonagh, 2011).

Researchers have explored a variety of reasons that may explain the gap between research and practice. Teachers' beliefs about how they should teach are heavily influenced by individual experience and are resistant to change (Korthagen, 2007). Moreover, because research is inconclusive and iterative by nature and, thus, can be difficult for practitioners to apply in their own settings, many teachers believe it to be irrelevant, inaccessible, and untrustworthy (Broekkamp & Van Hout-Woulters, 2007). Additionally, many teachers lack the necessary training to read and to evaluate research literature (Broekkamp & Van Hout-Woulters, 2007; Burkhardt & Schoenfeld, 2003; Gore & Gitlin, 2004). Considering their insufficient research training, reliance on personal experience, and distrust of research findings, many teachers are disconnected from research and are unequipped to assess and apply its findings.

Positive feedback is a prime example of this phenomenon. Despite decades of research demonstrating powerful effects, teachers continue to use positive feedback at very low rates, which has been a persistent problem (e.g., Scott, Alter, & Hirn, 2011; White, 1975). For example, in a review of studies of teacher feedback from 1970 – 2000, Beaman and Wheldall (2000) found teachers engaged in relatively low rates of positive feedback, much more often responding to inappropriate student behavior with negative

feedback. Additionally, Hirn (2011) examined 827 observations of teacher-student dyads across classrooms in a large, public, Southeastern high school. Target students in the study generally received low rates of feedback, with positive feedback occurring at a mean rate of once per 33 minutes and negative feedback once per 12 minutes. These data reflect the use of negative feedback at a rate nearly 2.5 times that of positive feedback, a near reversal of the recommended ratio of positive to negative feedback. Despite the fact positive feedback is a long-supported intervention for promoting positive student outcomes, this has yet to translate into common practice in the classroom. In fact, much of the focus of research on teacher practices, such as positive feedback, has shifted from demonstrating their effectiveness toward changing teacher behavior to implement these practices at efficacious rates (e.g., Myers, Simonsen, & Sugai, 2011).

Teacher Behavior Change. Researchers have made various proposals to close the research-to-practice gap, such as calling for better dissemination of research results to better effect changes in the classroom (e.g., Cook, Cook, & Landrum, 2013; Ducharme & Shecter, 2011; Grima-Farrell et al., 2011). They have suggested examining other fields that effectively use new developments in knowledge to transform practice, such as marketing theory (Cook et al., 2013), medicine, design, and consumer electronics engineering (Burkhardt & Schoenfeld, 2003). Others have suggested that researchers and practitioners should collaborate more closely to design and implement professional development to better meet the needs of teachers (Gore & Gitlin, 2004; Korthagen, 2007).

In addition to improving dissemination, researchers have studied various methods of delivering more effective professional development, including follow-up components

to provide more support. Examples of strategies to improve teacher practice have included active training with modeling, practice, and feedback (Sawka, McCurdy, & Mannella, 2002; Fullerton, Conroy, & Correa, 2009); peer coaching (Sutherland, 2000); self-evaluation (Sutherland, 2000); video self-modeling (Fullerton et al., 2009; Hawkins & Heflin, 2011); tiered levels of support based on performance criteria (MacSuga-Gage, 2013; Myers et al., 2011); negative reinforcement based on performance criteria (DiGennaro, Martens, & Kleinmann, 2007; DiGennaro, Martens, & McIntyre, 2005); coaching and performance feedback (Allday et al., 2012; Duchaine, Jolivette, & Fredrick, 2011; Myers et al., 2011; Rathel, Drasgow, & Christle, 2008; Sawka et al., 2002; Sutherland, Wehby, & Copeland, 2000); and visual performance feedback (Hawkins & Heflin, 2011; Reinke, Lewis-Palmer, & Martin, 2007).

Providing teachers with performance feedback has been a particularly effective intervention for improving teacher practice, including increasing their delivery of positive feedback (e.g., Duchaine et al., 2011; Myers et al., 2011; Scheeler, Congdon, & Stansbery, 2010). Performance feedback is a systematic approach to improve teacher practice in which an observer provides a teacher guidance through "(a) review of data, (b) praise for correct implementation, (c) corrective feedback, and (d) addressing questions or comments" (Codding, Feinberg, Dunn, & Pace, 2005, p. 205). Performance feedback has been a promising intervention for increasing desirable (e.g., rate of opportunities to respond, effective instruction components) and decreasing undesirable (e.g., incorrect signaling during direct instruction, delays during instruction) teacher behaviors (Cavanaugh, 2013; Scheeler, Ruhl, & McAfee, 2004).

Researchers have specifically demonstrated that performance feedback can increase teacher rates of positive feedback with positive collateral effects on student behavior. For example, when researchers have improved teacher practice with performance feedback, they have also observed increased student academic engagement (Allday et al., 2012) and decreased problem behavior (Myers et al., 2011; Reinke et al., 2007). Furthermore, data suggest that even when teachers are instructed to improve positive feedback to target students only, they generalize their use of positive feedback across students (Reinke et al., 2007).

Researchers have examined the differential effects of various modes of performance feedback delivery. While in many cases researchers have provided performance feedback during post-observation meetings with teachers, some have studied the effect of replacing the meeting with a brief e-mail. For example, using a multiple baseline design across three elementary and middle school teachers (and one non-concurrent replication with a fourth teacher), Allday et al. (2012) provided a simple, preliminary training followed by e-mail performance feedback every three sessions, which improved the use of positive feedback of all teachers. Further, Rathel, Drasgow, and Christle (2008) used a multiple baseline across two pre-service teachers during their internship and practicum experiences. The researchers initially trained the participants, providing operational definitions and examples of positive and negative feedback, and then showed the teachers their baseline rates of feedback. During the performance feedback condition, the observer sent participants an e-mail following each observation on the same day, which contained corrective feedback, the teacher's rate of feedback,

contingent praise, and an offer to answer any questions. Both participants demonstrated increased positive feedback and decreased negative feedback.

One promising practice in this line of research has been the addition of visual elements to performance feedback. Using a multiple baseline design, Reinke, Lewis-Palmer, and Martin (2007) evaluated the effect of training and visual performance feedback (VPF) on the positive feedback of three third-grade general education teachers. At the beginning of each session during treatment, the researchers provided teachers a computer-generated graph showing their frequency of positive feedback on the previous day. The researchers gave no verbal or written feedback with the graphs. After the initial training, the teachers continued to exhibit low rates of positive feedback; however, when VPF was introduced, each teacher increased positive feedback to multiple target students.

Building on the previous study, Hawkins and Heflin (2011) provided three high school teachers of students with emotional and behavioral disorders VPF. During the treatment conditions, the researchers met with participants after each session, providing graphs of their frequency of positive feedback as well as edited video of each teacher that highlighted examples of positive feedback from the previous session. The researchers used a multiple baseline across participants with embedded withdrawal design to demonstrate a functional relation between VPF and teacher feedback. Each teacher increased the frequency of positive feedback when receiving the VPF.

The effect of timing of performance feedback has been a question of growing interest. Researchers have explored whether more immediate feedback could be provided through the use of technology in order to provide teachers with immediate reinforcement and to prevent them from practicing errors (Scheeler et al., 2004). Multiple studies have

demonstrated the effectiveness of audio technology (often referred to as "bug-in-ear") for providing immediate feedback during sessions (Rock et al., 2009; Scheeler, McAfee, Ruhl, & Lee, 2006; Scheeler et al., 2010). Bug-in-ear refers to the use of a wireless microphone and earpiece whereby an observer can provide private feedback to the teacher during instruction. Scheeler et al. (2006) used an FM transmitter and headset to provide five pre-service teachers planned feedback statements during instruction. All teachers increased their completion of three-term contingency trials (in which the teacher provides an opportunity to respond, the student answers, and the teacher provides feedback) to high levels and maintained their performance up to four weeks after intervention.

Scheeler, Congdon, and Stansbery (2010) further examined the use of bug-in-ear mediated performance feedback by having co-teacher dyads provide feedback to one another. During baseline, the percentage of completed three-term contingency trials of six teachers ranged from 0 to 50. However, intervention produced an immediate effect for all teachers with this percentage ranging from 90 to 100 throughout the treatment condition. Furthermore, each teacher maintained these high rates of completion following fading of the intervention, and they generalized these higher rates to other classrooms and content areas.

One major concern regarding bug-in-ear mediated performance feedback is its potential to interrupt the flow of instruction and distract teachers (Scheeler et al., 2006). A potential solution for this concern is to combine the benefits of VPF with modern wireless technology, providing teachers with real-time graphical—rather than auditory—feedback. This method might allow teachers to choose less intrusive times to receive

feedback while also comparing their current and past performance. While limited

research has been conducted on real-time VPF in the field of education, some studies

have been reported in other fields such as counseling, public speaking, and workplace

safety. Real-time VPF—sometimes referred to as bug-in-eye—has been examined as a

tool for counseling supervision with computer monitors visible only to the therapist used

to provide supervision feedback during counseling sessions (e.g., Klitzke & Lombardo,

1991; Neukrug, 1991; Scherl & Haley, 2000). Additionally, similar technology (i.e.,

using teleprompters to provide unintrusive performance feedback) has been implemented

to significantly improve the use of eye contact by public speakers (King, Young, &

Behnke, 2000). Finally, real-time VPF regarding office workers' posture has been used

to improve workplace safety behavior (Sigurdsson & Austin, 2008).

Purpose of the Study

Despite evidence of the effectiveness of real-time VPF in other fields, researchers

have yet to test the effects of this intervention in classrooms. As such, there is a need for

well-designed studies to determine whether the intervention is as effective for improving

teacher practice in the classroom. Previous bug-in-ear studies provide a useful

framework for examining real-time VPF using technology. The purpose of this study is

to assess the effects of real-time VPF on teacher frequency of positive feedback, guided

by the following two specific research questions:

(1) To what extent is real-time VPF using wireless technology effective

for increasing teachers' rates of positive feedback?

(2) Do changes in teachers' rates of positive feedback produce any collateral effects (i.e., changes in teachers' negative feedback, student engagement, or student disruption)?

CHAPTER 2

REVIEW OF THE LITERATURE

While it is commonly acknowledged that teachers play a critical role in the

success of their students (e.g., Pianta, Belsky, Vandergrift, Houts, & Morrison, 2008),

teachers infrequently use certain evidence-based, instructional practices that are widely

recommended by researchers (Lewis et al., 2004). This infrequent implementation

continues despite evidence that such practices may greatly promote successful academic

and social outcomes for students who have significant need for high quality instruction

(e.g., students with disabilities). Many researchers in education have shifted their focus

from developing new interventions for students to instead intervening with teachers to

improve their use of already established practices. Performance feedback is an example

of an intervention focused on teacher behavior change that has growing support in the

literature. Various aspects of performance feedback warrant further study to determine

how best to influence teacher practice. The purpose of this chapter is to examine the

theory and research behind teacher behavior change interventions and to conduct a

systematic review of performance feedback research from the past 10 years to establish

the basis for the present study.

Framework

Teacher and student behavior are dynamically linked. That is, not only do the

practices teachers implement in the classroom affect student outcomes, but also the

academic and social behaviors in which students engage can have profound influence

over teacher behavior (e.g., Skinner & Belmont, 1993). While this reciprocal relationship

exists in classrooms, responsibility rests with teachers to engage in practices that

maximize the probability that all of their students will be successful (see Cook &

Schirmer, 2003). Toward that point, professional development for in-service teachers

represents an attempt to introduce change in the adult's behavior with the distal goal of

improving student outcomes. However, traditional professional development alone has

proven insufficient for producing lasting change in teacher practice (Gersten & Dimino,

2001; Kornblet, 1997). Additional components are necessary for many teachers to

augment the effects of professional development; accordingly, various interventions have

been developed to do so (e.g., Hawkins & Heflin, 2011; Myers et al., 2011). This

includes feedback interventions, which have been effective for improving the behavior of

both teachers and students (e.g., Allday et al., 2012).
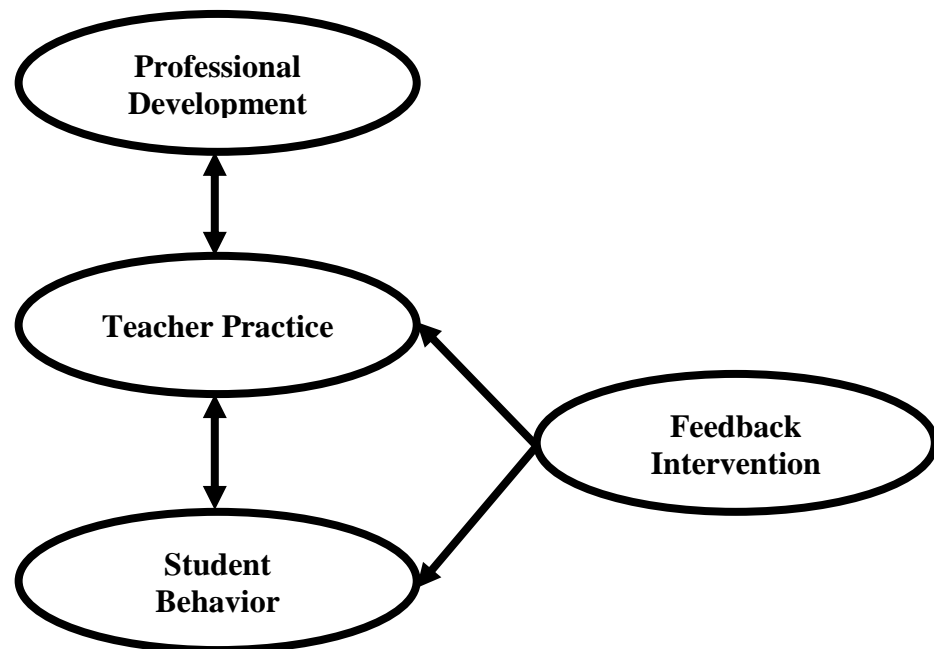
Figure 1. Conceptual framework for teacher behavior change.

In the following sections, each component of this conceptual framework (see Figure 1) is discussed briefly. Further, the theoretical underpinnings of feedback interventions will be discussed, including feedback intervention theory (FIT) and applied behavior analysis (ABA), as well as how feedback interventions have been used to improve the social and academic behavior of students and the practice of teachers. This framework serves as a foundation for the present study, which includes the use of performance feedback to augment the effects of professional development on teacher practice and, subsequently, to improve student outcomes.

Teacher practice. Though teachers have faced great scrutiny and criticism in recent years, not just anyone can walk into a classroom and produce positive academic and behavioral outcomes for students. While teachers vary in their effectiveness, the fact remains that they are one of the most influential factors for students' short- and long-term outcomes. In this vein of thought, nearly 30 years ago, Jere Brophy (1986) noted:

> Although it may be true that most adults could survive in the classroom, it is not true that most could teach effectively. Even trained and experienced teachers vary widely in how well they organize the classroom, articulate achievement expectations and objectives, select and design academic tasks, and instruct their students. Those who do these things successfully produce significantly more achievement than those who do not, but doing them successfully demands a blend of energy, motivation, subject matter knowledge, and pedagogical skills that many teachers, let alone ordinary adults, do not possess. (p. 1077)

Essentially, teachers and their practices matter.

Some researchers have sought to clarify whether teacher effects are truly responsible for student outcomes or whether other factors are more responsible, such as overall school effects. While research has indicated that schools as a whole impact students, it is the individual teachers who produce much more substantial effects, particularly on student achievement (Hill & Rowe, 1996; Luyten, 2003). These teacher effects are quite substantial with certain teachers able to produce much greater achievement gains across students (Nye et al., 2004). For example, Nye and colleagues (2004) found that for a typical student, the difference in having a 25th percentile and a 75th percentile teacher is more than one-third of a standard deviation in reading and nearly one-half of a standard deviation in math. Moreover, the researchers posited these are quite likely to be *underestimates* of the true differences between low- and high-performing teachers.

High-performing teachers harness two critical dimensions of effective teaching: quantity and quality of instruction (Brophy, 1988; Pianta et al., 2008). Quantity refers to the amount of exposure students have to academic content and opportunity to learn. As common sense might suggest, teachers who spend more classroom time on instructional content rather than other activities (e.g., transitions) produce greater student outcomes (Brophy, 1988). Furthermore, teachers who develop positive learning climates in which they engage in effective teaching practices experience fewer behavioral problems, have more engagement time with students, and generate greater student achievement (Brophy, 1988; Pianta et al., 2008).

Time spent with students actively engaged in instruction is one of the most significant predictors of student achievement (Brophy, 1986; Rosenshine, 1976;

Rosenshine & Berliner, 1978; Trout, Nordness, Pierce, & Epstein, 2003). Thus, effective

teachers engage in practices that maximize instructional time. Instructional time,

particularly time when students are actively engaged in academic learning tasks that are

focused on desirable learning objectives, has such a strong, fundamental relationship with

student achievement that David Berliner (1990) wrote:

> Instructional time has the same scientific status as the concept of homeostasis in
>
> biology, reinforcement in psychology, or gravity in physics. That is, like those
>
> more admired concepts, instructional time allows for understanding, prediction,
>
> and control, thus making it a concept worthy of a great deal more attention than it
>
> is usually given. (p. 3)

Considering the substantial impact of academic engagement, effective teachers use

classroom management procedures to limit behavior problems and reduce time lost to

transitions, so that they can remain task-oriented, spending most of their time actively

engaged in academic activities (Brophy, 1988; Pianta et al., 2008).

High-performing teachers augment the effects of this extensive instructional time

by also engaging in quality instruction. In the 1980s, researchers identified a number of

behaviors characteristic of high-quality teachers (Brophy, 1988; Brophy & Good, 1986).

Effective teachers teach actively with enthusiasm, clarity, specificity, brisk yet

appropriate pacing, and logical sequencing and structure that help students organize

content. Further, they ask clear and appropriate questions; provide clear, informative

feedback; elicit improved responses from struggling students; incorporate student

questions and comments into their instruction; and review and practice important

concepts or skills. Throughout instruction, they also provide active supervision and

employ classroom management procedures, minimizing disruptive behaviors. Moreover, as empirical evidence has grown, several teacher behaviors have been identified as evidence-based practices for improving the social and academic outcomes of students, particularly those with disabilities. Examples of practices that researchers have identified as promising or evidence-based include modeling, opportunities to respond, positive feedback, direct instruction, procedures and routines, and mediated scaffolding (e.g., Lewis et al., 2004; Trout et al., 2003).

Despite a wide array of effective practices with empirical support, many of them are used infrequently, and even when teachers do implement them, they do so with insufficient fidelity (Cook & Schirmer, 2003) This represents a disconnect between the knowledge base and practice in schools (Biesta, 2007; Broekkamp & van Hout-Woulters, 2007; Korthagen, 2007). Identifying evidence-based practices is of little use if these practices are not applied; thus, a major challenge for researchers has been the difficulty of translating empirically validated practices into the typical classroom (Grima-Farrell et al., 2011).

Researchers have explored a variety of reasons to understand the gap between research and practice. Many teachers believe research to be irrelevant and untrustworthy (Broekkamp & Van Hout-Woulters, 2007); further, teacher practice is often guided by personal experience and resistant to change (Korthagen, 2007). Perhaps these beliefs are fueled by the fact that many teachers lack the necessary training to read and evaluate research literature (Broekkamp & Van Hout-Woulters, 2007; Burkhardt & Schoenfeld, 2003; Gore & Gitlin, 2004). Overall, teachers feel distant from research and researchers

and are unequipped to assess research findings, so they rely more heavily on their own experience.

Student outcomes. Challenging problem behaviors—including behavior engaged in by students with emotional and behavioral disorders (EBD) and students whom scholars have determined to be at risk for EBD—are increasingly prevalent and complex problems in our schools (Biglan, 1995; Sugai, Sprague, Horner, & Walker, 2000; Taylor-Greene et al., 1997; Walker & Horner, 1996). As schools face the challenges of maladaptive behaviors, the pathways these students follow demonstrate serious need for effective intervention. These paths begin with multiple risk factors and lead to both short- and long-term negative outcomes that impact the students, their peers, their teachers, and society in general (Walker & Sprague, 1999). What begins as problems in the classroom over time tend to develop into problems in society.

In the short-term, the high rates of antisocial behavior exhibited by these youth lead to a negative impact in multiple components of their school life. Teachers have reported that these students are the most likely to engage in high rates of arguments, fights, office discipline referrals, and suspensions as well as frequently appearing lonely, depressed, distracted, and impulsive (Gonzalez, 2006; U.S. Department of Education, 2014). By engaging in frequent problem behavior, a small group of these students can account for a large portion of schools' discipline problems, consuming large amounts of teachers' and administrators' time (Sugai et al., 2000). When studying 11 elementary and nine middle schools from seven school districts in two states, Sugai, Sprague, Horner, and Walker (2000) found that only 5% of elementary students accounted for 59% of all referrals in each school, and 5% of middle school students accounted for 40.4% of all

referrals. Additionally, Taylor-Greene et al. (1997) found that at a middle school in the Northwest only 6% of students in a school of 530 accounted for 52% of all referrals. A very small portion of these schools' populations contributed roughly half of all office discipline referrals.

Due to the frequency and severity of challenging behaviors in the classroom, these behaviors present complex challenges in schools for teachers and students (Taylor-Greene et al., 1997). Student discipline problems have been a major source of teacher stress, dissatisfaction, and attrition (Boyle, Borg, Falzon, & Baglioni, 1995; Kyriacou, 2001). Accordingly, the U.S. Department of Education's (2014) thirty-sixth report on the implementation of IDEA described these behaviors as a burden on teachers. Further, in an analysis of teacher turnover, Ingersoll (2001) found that the largest contributing factor to teacher attrition was dissatisfaction, and student discipline problems were one of the major sources of teacher dissatisfaction.

Besides impacting school personnel, students with or at risk for EBD experience short-term social and academic consequences of their behavior. These students experience rejection by their peers and teachers (Walker & Sprague, 1999). Academically, they tend to have low rates of engagement and low achievement (U.S. Department of Education, 2014; Walker & Sprague, 1999). Students with EBD also have among the highest rates of dropout of all students (Bullis & Cheney, 1999; Wagner, Newman, Cameto, Garza, & Levine, 2005; Walker & Sprague, 2001). Bullis and Cheney (1999) reported data from the first National Longitudinal Transition Study that suggest students with EBD dropped out of school at nearly three times the rate of students without disabilities (58.6% to 20%, respectively).

These poor outcomes during school put students with high rates of challenging behavior at higher risk for future criminality, violence, and a host of other negative outcomes (Walker & Sprague, 1999). In one longitudinal study, following high school, only 17% of youth with EBD enrolled in any kind of postsecondary education within two years of leaving high school compared to 53% of their peers in the general population (Blackorby & Wagner, 1996); and Zigmond (2006) found that of those who did enroll, few reached completion due to instability. As far as five years after high school, these youth also had poor employment outcomes, including low rates of employment, unstable employment, low pay, little improvement in pay over time, few hours, and no benefits (Bullis & Cheney, 1999; Wagner et al., 2005; Zigmond, 2006). Over a third of these youth—more than any other disability category—promptly move out from their parents' home without any support, often leading to undesirable living conditions. A disproportionate number end up living in "criminal justice or mental health facilities, under legal guardianship, in foster care, or on the street" (Wagner et al., 2005, p. 8-7). They also had encounters with law enforcement beginning in middle and high school and have a higher risk of committing crime following school (Walker & Sprague, 1999). Wagner et al. (2005) reported that well over half of these youth have been arrested at least once after high school and over three-quarters have had encounters with the police. Furthermore, these youth have high risk for substance use and abuse (Bullis & Cheney, 1999; Walker & Sprague, 1999).

Overall, students with or at risk for EBD have high justice system involvement, prevalent mental health needs, lifelong social service needs, and higher hospitalization rates (Walker & Sprague, 1999). These behavior problems ultimately affect the students'

peers, teachers and administrators, and wider communities all while having very negative

short- and long-term effects on the students themselves.

The weight of the impact of challenging behavior necessitates that schools and

other organizations take effective measures and implement interventions that improve the

academic and behavioral outcomes of such students. However, schools have frequently

employed traditional, ineffective classroom management and discipline measures (e.g.,

punishment, suspension, etc.; Morgan-D'Atrio, Northup, LaFleur, & Spera, 1996; Taylor-

Greene et al., 1997). In fact, ineffective and inconsistent behavior management practices

can incite and promote problem behaviors rather than improve them (Kauffman &

Landrum, 2013). Teachers need effective training to learn how to provide effective

support for students who present such grave challenges.

Professional development. While teacher practice is resistant to change

(Korthagen, 2007), strategies are necessary that impact actual practice in the classroom.

Disseminating research results in ways that effect change in the classroom is an important

issue under study, particularly in the fields of special education and behavior disorders

(e.g., Cook et al., 2013; Ducharme & Shecter, 2011; Grima-Farrell et al., 2011).

Researchers have examined other fields that effectively use new development in

knowledge to transform practice, such as marketing theory (Cook et al., 2013) medicine,

design, and consumer electronics engineering (Burkhardt & Schoenfeld, 2003).

Catalyzing change through traditional professional development (i.e., single,

topical in-service trainings) can be challenging; even when effective practices are used,

outcomes in teacher learning and change are inconsistent (Opfer & Pedder, 2011). While

some characteristics of effective professional development have been identified, they are

not consistently predictive of teacher learning and change. Sometimes teachers do not learn or change when these characteristics are present, while some teachers learn and change following professional development that lacks empirically validated characteristics (Desimone, 2009; Opfer & Pedder, 2011)

One possible explanation for inconsistent outcomes is that teaching takes place in complex environments, so context may moderate the impact of professional development (Dall'Alba & Sandberg, 2006; Opfer & Pedder, 2011; van den Berg, 2002; Webster-Wright, 2009). Teacher contexts involve multiple levels, such as the individual; subgroups based on content, grade level, and/or program; the school; the school system; and even the wider sociopolitical environment (Opfer & Pedder, 2011). Professional development has often involved isolating skills from context rather than situating content in the complexity of school environments (Opfer & Pedder, 2011).

In addition to considering context, Opfer and Pedder (2011) and Webster-Wright (2009) recommended changing the emphasis away from the development of teachers to support of learning and change. Webster-Wright (2009) makes a number of assertions regarding teacher learning that should be noted. The extant literature primarily focuses on training delivery rather than deeper understanding of how teachers learn and what supports their learning. This training is often decontextualized, emphasizing strong professional development programs with strong facilitators. These scholars have contended that professional development must be reframed to focus on learning rather than training, while attending to the complex environments in which teaching occurs and to the characteristics of teachers that impact learning and change.

Teacher learning is complex and comprised of many contributing factors. Teacher learning is "multicausal, multidimensional, and multicorrelational" (Opfer & Pedder, 2011,p. 394), "active, situated, social, and constructed," and supported by experience and reflection (Webster-Wright, 2009, p.720). While teacher learning has been proposed to take place in sequential stages or steps, due to its complexity, linear models of thinking are insufficient (Dall'Alba & Sandberg, 2006; Opfer & Pedder, 2011; van den Berg, 2002).

Researchers have made various recommendations to strengthen the effects of professional development, better accounting for these contextual issues and the cyclical nature of learning. For example, some specific strategies include collaborating more closely with practitioners to design and implement professional development (Gore & Gitlin, 2004; Korthagen, 2007), incorporating teachers' prior experience as well as time for feedback and reflection (van den Berg, 2002; Webster-Wright, 2009), emphasizing the application of new skills in specific teacher contexts (Dall'Alba & Sandberg, 2006), and building teacher meanings (van den Berg, 2002; see also Cook et al., 2013).

Even with improved delivery, isolated training may be insufficient to produce desired outcomes in teacher practice. Much professional development follows this train and hope approach, lacking specific components to help teachers generalize new skills into their classrooms and maintain them over time (Stokes & Baer, 1977).

In response to the shortcomings of a train and hope approach, a host of strategies have been developed to augment the effects of professional development. Examples of strategies to improve teacher practice have included active training with modeling, practice and feedback (Fullerton et al., 2009; Sawka et al., 2002); peer coaching and self-

evaluation (Sutherland, 2000); video self-modeling (Hawkins & Heflin, 2011); multi-tiered interventions (MacSuga-Gage, 2013; Myers et al. , 2011); negative reinforcement for meeting performance criteria (DiGennaro et al., 2007; DiGennaro et al., 2005); coaching and performance feedback (Allday et al., 2012; Duchaine et al., 2011; Myers et al., 2011; Rathel et al., 2008; Sawka et al., 2002; Sutherland et al., 2000); and visual performance feedback (Hawkins & Heflin, 2011; Reinke et al., 2007).

Feedback Interventions

Kluger and DeNisi (1996) defined feedback interventions as "actions taken by (an) external agent(s) to provide information regarding some aspect(s) of one's task performance" (p. 255). They proposed Feedback Intervention Theory, which includes five components: (a) feedback informs people of their performance relative to goals or standards, which leads to a change in behavior when there is a discrepancy; (b) people have a hierarchy of goals and standards with high level goals of the self (e.g., "become a researcher") influencing lower level action goals (e.g., "study my textbook for the statistics exam"); (c) because attention is limited, behavior is only affected by feedback-standard discrepancies that receive attention; (d) attention is typically directed to the middle of the hierarchy, with less attention given to high-level self-goals and low-level tasks; and (e) feedback interventions affect behavior by drawing attention to a specific discrepancy. Further, feedback is most effective when it is focused lower in the hierarchy, attending to one's performance of a task (i.e., correct or incorrect; e.g., "Yes, the answer is 42"), the processes used to complete the task (e.g., the use of a specific strategy to complete a task; "I like how you used the graphic organizer and manipulatives to solve this word problem"), or one's self-regulatory skills (i.e., one's sense of self-

efficacy and ability to self-evaluate; e.g., "Good effort on this essay; read through it, and check to see whether you used the TREE strategy"), rather than focusing on the self (e.g., "You're so smart"), which is ineffective (Hattie & Timperley, 2007; Kluger & DeNisi, 1996). Aspects of feedback intervention theory are compatible with a behavioral view of feedback; for example, researchers with a behavior analytic approach have found that to be effective feedback must include specific information regarding the targeted behavior (e.g., Brophy, 1981).

Much of the research on feedback interventions in applied classroom settings has been conducted by proponents of ABA (e.g., Cossairt, Hall, & Hopkins, 1973). ABA is a scientific approach built upon principles of behaviorism and behavior modification for the "systematic application of environmental manipulations" (Cooper, 1982, p. 115; see also Cooper, Heron, & Howard, 2007). Many evidence-based classroom management practices and systems (e.g., positive behavior interventions and supports) rely on critical contributions from the field of ABA, such as functional assessment, function-based interventions, emphasis on variables that trigger and maintain behavior, data-based analysis, and principles of behaviorism (Dunlap, Carr, Horner, Zarcone, & Schwartz, 2008; Sugai et al., 2000). In a school context, teachers who use a behavior analytic approach are concerned with the function of behavior, and they examine and manipulate the antecedents and consequences of student behaviors to improve the probability of student success. By controlling environmental variables or setting events and implementing systematic, function-based reinforcers and punishers, teachers can increase the occurrence of desirable behaviors while decreasing the occurrence of challenging behaviors. This process can be used to shape and chain complex replacement behaviors

to teach students behavioral skills that can improve their quality of life and achievement (Bloh & Axelrod, 2008; Dunlap et al., 2010; Kamps, 1997).

Feedback interventions may very well operate on a hierarchy of goal-standard discrepancies related to a person's motivation and attention; however, these constructs are obscured by our inability to directly measure them. That is, one cannot spend an hour in a classroom and determine objectively the level of motivation a teacher or student has to achieve a goal. However, using a behavior analytic approach, one focuses only on what can be directly observed, operationally defining and measuring specific behaviors and attending to relevant antecedents and consequences.

Behavioral researchers have suggested that feedback may serve multiple functions. Feedback is commonly considered a reinforcer (i.e., a behavioral consequence that leads to increased future frequency of the targeted behavior); however, some have stressed that it depends on the effect observed with feedback possibly serving as a reinforcer or a punisher (i.e., leading to decreased future frequency) or having no effect at all (see Cooper et al., 2007). Moreover, various researchers have argued that feedback may serve a variety of functions, including that it can: (a) function as an antecedent variable, or discriminative stimulus, signaling that reinforcement is available for a certain behavior; (b) act as an establishing operation, increasing the effectiveness of a reinforcer; or (c) evoke rule-governed behavior, affecting a behavior through a verbal contingency (Alvero, Bucklin, & Austin, 2001; Crowell, Anderson, Abel, & Sergio, 1988).

Feedback interventions have been applied to both student and teacher behavior. The following two sections discuss the use of: (a) positive feedback to improve student behavior and learning, and (b) performance feedback to improve teacher practice.

26

Positive feedback for students. Feedback is perhaps one of the most powerful

practices teachers have readily available to improve student prospects, including raising

student achievement (Hattie & Timperley, 2007) and managing student behavior

(Simonsen et al., 2008). Teachers who engage in high rates of effective feedback have a

significant impact on their students, decreasing their disruptive behavior and increasing

their time on-task and achievement levels (e.g., Apter, Arnold, & Swinson, 2010;

Brophy, 1981; Matheson & Shriver, 2005). Teacher feedback includes verbal and

nonverbal responses to students, wherein teachers provide information regarding

students' academic or behavioral performance. Furthermore, teachers can employ

positive feedback to indicate to students that a behavior or response was appropriate or

correct or negative feedback to indicate disapproval or incorrectness. These two forms of

feedback guide students in their development of specific skills and knowledge (see Hattie

& Timperley, 2007) and help students build upon concepts and behaviors they have

already learned as well as correct any errors (Engelmann & Carnine, 1991). Feedback is

a critical aspect of academic and behavioral learning for students. Accordingly, positive

feedback has been considered an instructional best practice for all students, including

those with the most challenging behavior (Lewis et al., 2004; Simonsen et al., 2008).

Researchers have made specific recommendations to maximize the effectiveness

of positive feedback, including that it should: (a) occur contingently after the

performance of a desired behavior or response; (b) contain specific information regarding

what the student did correctly or appropriately, making a clear connection between the

feedback and the behavior; (c) occur frequently, especially during the acquisition stage of

learning; (d) be credible, ensuring that the teacher's gestures and tone of voice do not

contradict the message; (e) occur soon after the behavior or response; and (f) be delivered at much higher rates than negative feedback (Brophy, 1981; Hattie & Timperley, 2007; Scott et al., 2012; Shute, 2008; Stichter et al., 2009; Trussell, 2008).

Despite the effectiveness of positive feedback and longstanding researcher recommendations that it be used frequently, direct observation studies of classrooms have demonstrated that positive feedback has continued for decades to naturally occur at very low rates (e.g., Beaman & Wheldall, 2000; Scott et al., 2011; White, 1975). Thus, the key issue has transitioned from identifying positive feedback as an effective practice to establishing effective interventions to change teacher behavior.

Performance feedback for teachers. Given low rates of well-established, instructional practices, such as positive feedback, the attention of many researchers has turned toward teacher behavior change. One promising strategy with a growing evidence base for improving teacher's use of positive feedback is the application of feedback interventions to teacher practice. Performance feedback is the use of observation-based data to provide non-evaluative information to teachers to increase their awareness of their teaching practice, to reinforce desired teacher behaviors, and to correct undesired behaviors (Duchaine et al., 2011). Performance feedback has been used to improve a variety of teacher practices; for example, it has been employed specifically to increase teacher use of positive feedback in a variety of settings, including elementary school inclusion and self-contained classrooms (Allday et al., 2012; Rathel et al., 2008), middle school inclusion and self-contained classrooms (Myers et al., 2011; Sutherland et al., 2000), and high school inclusion classrooms (Duchaine et al., 2011).

Two literature reviews (Cavanaugh, 2013; Scheeler et al., 2004) and one meta-analysis of single-subject studies (Solomon, Klein, & Polityло, 2012) have been conducted in the past 10 years to examine the evidence base for performance feedback. Scheeler, Ruhl, and McAfee (2004) conducted the first review, identifying 10 experimental and quasi-experimental studies of performance feedback, the majority of which were conducted with preservice teachers. They discussed several important attributes of feedback, including the (a) content (i.e., corrective, noncorrective, general, positive, and specific feedback) and mode (e.g., bug-in-ear) of feedback, (b) timing (i.e., immediate vs. delayed) of feedback, and (c) agent (e.g., university supervisor, peer coach) of feedback delivery. They found that performance feedback that is immediate, specific, positive, and corrective is most effective for improving a variety of teacher practices, including praise, direct instruction, efficient use of time, and responding to behavior problems. Further, they discussed that more research was needed to examine different agents of feedback delivery and to compare various modes of feedback. Regarding the latter, they recommended further research of modes to deliver immediate feedback *in situ* in the least intrusive way possible, suggesting that a bug-in-ear device may be promising.

Cavanaugh (2013) and Solomon, Klein, and Polityло (2012) conducted a review and a meta-analysis, respectively, in 2011. Unlike Scheeler et al., they restricted study inclusion criteria to include only specific dependent variables (i.e., praise, OTRs, and treatment integrity). Cavanaugh found that performance feedback was useful for improving teacher rates of praise and promising (yet inconclusive) in regard to OTRs. He noted that nearly all of the 25 reviewed studies relied on researchers or outside

experts rather than natural, on-site implementers to provide performance feedback. He also discussed that many included studies lacked sufficient designs to demonstrate experimental control. Solomon et al. conducted a meta-analysis of 36 single-subject studies on the effect of performance feedback on treatment integrity. Overall, performance feedback was moderately effective for improving integrity and preventing drop-offs with small, positive effects on student performance. The researchers also recommended further research on the agent and mode of feedback.

Purpose. While Scheeler and her colleagues were only able to identify 10 studies of performance feedback prior to 2004, performance feedback has become an intervention of greater interest in the last 10 years. The purpose of the remainder of this chapter is to systematically update the 2004 review conducted by Scheeler et al. without the restrictions of the more current review and meta-analysis (Cavanaugh, 2013; Solomon et al., 2012). This review, however, will focus on behavior change for inservice teachers.

Method

A comprehensive review of published journal articles on performance feedback for teachers of school-age students was conducted in several steps. First, electronic searches of the ERIC, PsycINFO, and ProQuest databases from 2004 to August 2014 were performed using combinations of the following keywords: *performance feedback*, *teachers*, *feedback*, *coaching*, and *bug-in-ear*. Next, an ancestral search was conducted to identify other salient studies by examining the reference lists of identified articles as well as the two more recent reviews (Cavanaugh, 2013; Solomon et al., 2012).

Following the searches, titles and abstracts were read to find potential matches, then all relevant articles were read, and studies were selected that met the following criteria:

1. The article must include an empirical study, using an experimental or quasi-experimental design (Shadish, Cook, & Campbell, 2002).

2. The study must be published in a peer-reviewed journal.

3. The study must take place in an elementary, middle, or high school or a specialized school with inservice teachers.

4. Performance feedback must be included as the independent variable or as a major component of a treatment package that is manipulated by the researchers.

5. Some form of observable teacher behavior must be a dependent variable (e.g., positive feedback, questions, etc.)

Results

The initial online searches of databases and salient journals yielded 560 search results. After reading titles and abstracts, 49 potential articles were identified for a full reading. Nineteen articles were excluded due to not meeting one or more selection criteria. Generally, articles that were excluded were not experimental, targeted early childhood teachers, involved different recipients of performance feedback (i.e., students, paraprofessionals, schools), or lacked an experimental design. The remaining 30 articles are included for review (see Table 1 for a summary of each study).

Participants and Settings. Overall, 233 teachers (170 general education, 30 special education, and 33 unspecified) were included in these studies; generally, many of the studies included little participant demographic information other than grade level and

31

years of teaching experience. Participating teachers had anywhere from 0 to 42 years of experience teaching. Most of the studies were conducted in elementary and middle school classrooms with 19 studies taking place in elementary schools, seven in middle schools, two in high schools, two in alternative high schools for students with serious challenging behavior, and three in private schools for students with various disabilities.

Table 1

Studies of Performance Feedback from 2004 to 2014

Authors	Participants	Context	Design	Intervention	Mode	Timing	Agent	PF isolated	Dependent Variables	Reliability / Fidelity	Findings
Allday et al., 2012	4 gen. ed. teachers 7 students with or at risk for EBD (5-12 years old)	4 gen. ed., elementary classrooms (grades K, 1, 2, & 6) during circle/ center time	Modified multiple baseline	Teacher training and performance feedback	E	Every third day	Researchers	No	Rate of Teacher BSP; Student Engagement	Reliability: 75%-86% Fidelity: Not reported	Teachers increased BSP; student engagement increased
Codding, Feinberg, Dunn, & Pace, 2005	3 spec. ed. teachers with .5-2.5 years of exp. 5 students with brain injuries (ages 10-19)	2 classrooms in a private school for students with acquired brain injuries	Multiple baseline	Performance feedback	M	Same day	Researchers	Yes	Treatment integrity (implementing antecedents and consequences from behavior support plans)	Reliability: 91%-100% Fidelity: Not reported	All teachers improved their implementation of behavior plans and maintained the improvements over time
Codding, Livanis, Pace, & Vaca, 2008	1 spec. ed. teacher and 2 aides with 0-9 years exp.	1 self-contained classroom for 7 students (grades 6 and 8)	Multiple baseline	Performance feedback	M	Within 10 minutes of session	Researchers	Yes	Treatment integrity (classroom behavior management plan)	Reliability: 79%-100% Fidelity: 100%	All participants increased treatment integrity. (Also, controlled for observer reactivity, finding no difference in treatment integrity based on observer presence)
Codding, Skowron, & Pace, 2005	3 spec. ed. teachers with .5-2 years of exp.	Private school for students with acquired brain injuries	Multiple baseline	Modeling, practice, and performance feedback	M	During next session	Researchers	No	Treatment integrity (using CBM data to write IEP objectives)	Reliability: 95%-100% Fidelity: 100%	All teachers increased integrity, writing better CBM-linked IEP objectives

33

TABLE 1
(*Continued*)

Authors	Participants	Context	Design	Intervention	Mode	Timing	Agent	PF isolated	Dependent Variables	Reliability / Fidelity	Findings
Codding & Smyth, 2008	3 gen. ed. teachers with 2-8 years exp.	3 9th grade biology classrooms; 16-24 students per class	Multiple baseline	Performance feedback, goals, and coaching on classroom management strategies	M,G	Daily	Researchers	Yes	Transition time (in seconds) Instructional Time Student engagement	Reliability: 86%-100% Fidelity: 85.7%-100%	Teachers spent less time on transitions and more on instruction; student engagement increased; effects were maintained after IV faded
DiGennaro, Martens, & McIntyre, 2005	4 gen ed. teachers with 2-30 years of exp.

4 students with challenging behavior | 4 gen. ed., elementary classrooms (grades K, 2, 4, 5, and 6) | Multiple baseline | Training and performance feedback with direct rehearsal and negative feedback | W,G | Daily | Researchers | No | Treatment integrity (behavior intervention plans); Student off-task behavior | Reliability: 75%-100% Fidelity: 82%-100% | All teachers improved their implementation of behavior plans with maintained effects after treatment package was faded |
| Duchaine, Jolivette, & Fredrick, 2011 | 2 gen. ed. and 1 spec. ed. Math teachers with 2-8 years of exp.

62 students with disabilities (ages 15-17) | 3 inclusive, co-taught, 9th grade Math classrooms; 18-24 students per class | Multiple baseline | Teacher coaching with goal-setting and feedback | W | After every session | Researchers | No | Frequency of teacher BSP; Student Engagement | Reliability: 91%-98% Fidelity: 95%-100% | All teachers increased BSP; Overall student engagement decreased in two classes and increased in one class |

34

TABLE 1
(*Continued*)

Authors	Participants	Context	Design	Intervention	Mode	Timing	Agent	PF isolated	Dependent Variables	Reliability / Fidelity	Findings
Duhon, Mesmer, Gregerson, & Witt, 2009	Study 1: 3 gen. ed. teachers with 3-12 years exp. Study 2: 4 gen. ed. teachers with 5-15 years exp.	Study 1: 3 gen. ed., elementary classrooms (grades K and 3) Study 2: 4 gen. ed., elementary classrooms (grades 1 and 3)	Multiple baseline	Training and performance feedback to RTI team	M,G	Weekly	Researchers	Yes	Treatment integrity (academic interventions); Student academic performance	Study 1 Reliability: 92%-100% Fidelity: Not reported Study 2 Reliability: 95%-100% Fidelity: Not reported	Study 1 and 2: Teachers immediately improved treatment integrity but stopped implementing interventions as soon as perf. feed. was removed; students improved academic performance
Duncan, Dufrene, Sterling, & Tingstrom, 2013	2 gen. ed. teachers and 1 Head Start teacher 3 students with mild problem behavior	2 gen. ed., 5th grade classrooms during reading and math instruction; 1 Head Start classroom during academic activities	Multiple baseline with embedded withdrawal design	Training, goal setting, and performance feedback with generalization training	W	Daily	Researchers	No	Teacher rate of specific praise; student disruptive behaviors	Reliability: 83%-100% Fidelity: 100%	All teachers increased their rate of praise toward target and non-target students; overall student disruptive behavior decreased
Gilbertson, Witt, Singletary, & VanDer-Heyden, 2007	5 gen. ed. teachers 5 students with difficulties in math (ages 7-11)	5 gen. ed., elementary classrooms (grades 1, 4, and 5); 23-28 children per class	Non-concurrent multiple baseline	Training and response-dependent performance feedback	M,G	Next session	Researchers	Yes	Treatment integrity (peer tutoring intervention); Student math performance	Reliability: 96%-100% Fidelity: 94%-100%	3 teachers improved treatment integrity to high levels, 1 teacher required an additional meeting to make improvements, and 1 teacher did not need the treatment; student math scores improved

TABLE 1
(*Continued*)

36

Authors	Participants	Context	Design	Intervention	Mode	Timing	Agent	PF isolated	Dependent Variables	Reliability / Fidelity	Findings
Goodman, Brady, Duffy, Scott, & Pollard, 2008	3 novice, spec. ed. teachers	1 classroom for students with EBD and OHI (grades 6-8); 2 classrooms for students with autism and developmental disabilities (grades K-3)	Multiple baseline	Real-time coaching and performance feedback	B,M	Immed.	Researchers	No	Rate of accurate teacher learn units (antecedent, behavior consequence)	Reliability: 90% Fidelity: None reported	All teachers increased their rate and accuracy of learn unit delivery
Gross, Duhon, & Doerksen-Klopp, 2014	3 gen. ed. teachers with 1-17 years of exp. 3 students with academic or behavioral difficulties (ages 5-7)	3 gen. ed. classrooms (grades K-2)	Non-concurrent multiple baseline	Training and performance feedback with direct rehearsal	M,G	Daily	Researchers	No	Treatment integrity (academic and behavior intervention plans); Student classroom behavior and academic performance	Reliability: 83%-100% Fidelity: None reported	All teachers improved treatment integrity and sustained improvements throughout fading procedures; students had overall mean improvements for academic and behavioral performance
Hawkins & Heflin, 2011	3 spec. ed. teachers with 2-7 years of exp.	3 self-contained classrooms in an alternative high school for students with EBD	Multiple baseline with embedded withdrawal design	Performance feedback with video self-modeling	M,G,V	Next session	Researchers	No	Teacher BSP, non-specific praise, and reprimands	Reliability: 86%-100% Fidelity: 96%-100%	All teachers increased their rate of praise; two teachers did not maintain the improvements during withdrawal

TABLE 1
(*Continued*)

Authors	Participants	Context	Design	Intervention	Mode	Timing	Agent	PF isolated	Dependent Variables	Reliability / Fidelity	Findings
Machalicek et al., 2010	6 spec. ed. teachers with 6-10 years of exp.	Classroom in a private school for children with autism spectrum disorders and developmental disabilities	Multiple baseline	Real-time performance feedback	T	Immed.	Researchers	Yes	Treatment integrity (functional analysis conditions)	Reliability: 80%-100% Fidelity: 75%-100%	All teachers improved their implementation of all functional analysis conditions
Matheson & Shriver (2005)	3 gen. ed. teachers with <5 years of exp. 3 students with low levels of compliance	3 gen. ed. classrooms (grades 2 and 4) during reading and math instruction; 23-26 total students per class	Multiple baseline	Teacher training, coaching, and performance feedback	W	Next session	Researchers	No	Teacher ratio of effective commands and rate of praise; percent of student compliance, student engagement, and student inappropriate behavior.	Reliability: 87%-90%; Fidelity: None reported	Teachers increased rates of effective commands and praise during their respective conditions; student compliance, engagement, and behavior all improved.
McKenney, Waldron, & Conroy, 2013	3 gen. ed. teachers with 1-24 years of exp.	3 gen. ed., middle school classrooms (grades 6-8) during science, math, and social studies	Non-concurrent multiple baseline	Teacher training, modeling, and performance feedback	M	Unclear	Researchers	No	Treatment integrity (functional analysis procedures)	Reliability: 65%-100% Fidelity: None reported	2 teachers improved implementation of functional analysis; the third teacher demonstrated improvements prior to receiving training and performance feedback

TABLE 1
(*Continued*)

Authors	Participants	Context	Design	Intervention	Mode	Timing	Agent	PF isolated	Dependent Variables	Reliability / Fidelity	Findings
Myers, Simonsen, & Sugai, 2011	3 gen. ed. and 1 spec. ed. teacher with 0-11 years of exp.	1 self-contained, 1 inclusion, and 2 gen. ed., middle school classrooms (grades 5-7)	Multiple baseline	Tiered intervention, including teacher training, consultation and performance feedback	M,W, G,E	Weekly (Tier 2) Next Day (Tier 3)	Researchers	Yes	Teacher praise and reprimands; Student engagement and disruptive behavior	Reliability: 89%-100% Fidelity:	All teachers improved their use of praise, though some teachers required more intensive supports (i.e., Tier 3); student behavior improved
Noell et al., 2005	45 gen. ed. teachers with 0-35 years of exp.	6 elementary schools	3-by-3 split-plot analysis	Consultation, weekly follow-up meetings, commitment emphasis, and performance feedback	M,G	Daily (rapidly faded to weekly)	Consultants (doctoral students)	Yes	Treatment integrity (academic and behavior intervention plans); Student behavior and academic performance	Reliability: None reported Fidelity: None reported	Teachers who received performance feedback had substantially higher treatment integrity than other groups; their students also made greater gains
Pisacreta, Tincani, Connell, & Axelrod (2011)	3 gen. ed. teachers with 2.5-11 years of exp.	3 gen. ed. middle school Math, Science, and Literacy classrooms (grades 6-8); 15-20 total students per class	Multiple baseline	Teacher training, modeling, and performance feedback	G	Weekly (brief comments daily)	Researchers	Yes	Frequency of teacher praise and reprimands; student disruptive behavior (classroom composite)	Reliability: 70%-100% Fidelity: None reported	All teachers increased their praise ratio to roughly 1:1 or higher with concurrent decreases in student disruptions; teachers also generalized improvements to other settings

TABLE 1
(Continued)

Authors	Participants	Context	Design	Intervention	Mode	Timing	Agent	PF isolated	Dependent Variables	Reliability / Fidelity	Findings
Ploessl & Rock, 2014	3 co-teaching dyads (3 gen. ed. and 3 spec. ed. teachers) with1-28 years of exp.	3 inclusive, co-taught, elementary classrooms	Withdrawal Design	Real-time coaching and performance feedback	T,B	Immed.	Researchers	Yes	Number of planned and implemented co-teaching models; number of individualized accomodations; frequency of praise and reprimands	Reliability: 80% Fidelity: 94%-99% (*not clearly defined*)	Co-teaching dyads used more co-teaching models and student accomodations
Reinke, Lewis-Palmer, & Martin (2007)	3 gen. ed. teachers with 4-29 years of exp. 6 students with disruptive behavior and 6 comparison peers	Three 3rd grade, gen. ed classrooms; 20-25 students total in each class	Multiple baseline	Group consultation meetings and daily visual performance feedback	G	Daily	Researchers	Yes	Probability of teacher praise; student engagement and disruptive behavior	Reliability: 72%-88%; Fidelity: None reported	Teachers were more likely to use BSP for target students and comparison peers when students were engaged; disruptive behavior decreased for all students
Reinke, Lewis-Palmer, & Merrell (2008)	4 gen. ed. teachers with 5-25 years of exp.	Four 1st, 2nd, and 5th grade classrooms in two elementary schools during math instruction	Multiple baseline	Classroom Check-up, including consulting, self-monitored intervention implementation, and visual performance feedback.	G	Daily	Researchers	Yes	Rate of teacher praise and reprimands; rate of student disruptions (classroom composite)	Reliability: 80%-85%; Fidelity: 100%	Performance feedback led to increased rates of teacher BSP and reduced rates of reprimands, with reductions in classroom disruptions.

TABLE 1
(*Continued*)

Authors	Participants	Context	Design	Intervention	Mode	Timing	Agent	PF isolated	Dependent Variables	Reliability / Fidelity	Findings
Reinke, Stormont, Herman, & Newcomer, 2014	52 gen. ed. teachers with 1-42 years of exp.	Elementary classrooms during reading and math instruction (grades K-3)	Two-group (high vs. low dose) longitudinal design	Training workshops and coaching with goal-setting and performance feedback	M,G	Weekly	Researchers	No	Frequency of teacher praise, precorrections, and reprimands	Reliability: 81%-95% Fidelity: None reported	Teachers increased their rate of praise and decreased their rate of reprimands after receiving coaching and performance feedback; further, teachers in the high-dose group exhibited significantly greater improvements
Rock et al., 2012	13 gen. ed. teachers with 1-13 years of exp.	13 gen. ed. classrooms in 10 elementary schools (grades K-6)	One-group pretest-posttest design	Real-time coaching and performance feedback	T,B	Immed.	Researchers	Yes	Rate of teacher opportunities to respond, reprimands, and praise; student engagement	Reliability: 70%-100% Fidelity: None reported	Increased high-access OTRs (e.g., choral responding, think-pair-share) and praise
Rock et al., 2009	15 gen. ed. and spec. ed. teachers with 1-20 years of exp.	Elementary classrooms in 12 schools across 6 districts	One-group pretest-posttest design	Real-time coaching and performance feedback	T,B	Immed.	Researchers	No	Teacher use of praise, reprimands, round-robin reading, partner strategies, group OTRs, and cloze reading; Frequency of student hand-raising, blurt-outs, and disruptions; Student engagement	Reliability: 80%-100% Fidelity: None reported	Teachers improved their use of instructional strategies and praise; student engagement increased

TABLE 1
(*Continued*)

Authors	Participants	Context	Design	Intervention	Mode	Timing	Agent	PF isolated	Dependent Variables	Reliability / Fidelity	Findings
Rock et al., 2014	14 gen. ed. and spec. ed. teachers with 1-20 years of exp.	Elementary classrooms in 13 schools across 6 districts	One-group repeated-measures design	Real-time coaching and performance feedback	T,B	Immed.	Researchers	Yes	Teacher use of low and high access instructional practices, praise, and reprimands; student engagement	Reliability: 86%-99% Fidelity: None reported	Teacher instructional practices and rates of praise improved; student engagement significantly improved
Sanetti, Fallon, & Collier-Meek, 2013	5 gen. ed. teachers 2 internal consultants (school social worker and spec. ed. teacher)	5 8th grade, middle school classrooms	Multiple baseline	Training and performance feedback	M,G	Within 1 week (as needed)	Internal Consultants	Yes	Treatment integrity (classwide behavior management plan); consultant treatment integrity (performance feedback); student office referrals	Reliability: None reported Fidelity: 78%-95%	3 teachers exhibited slightly decreased treatment integrity while 2 showed improvement; consultants had fairly high treatment integrity; students had fewer office referrals
Scheeler, Congdon, & Stansbery, 2010	3 co-teaching dyads (3 gen. ed. and 3 spec. ed. teachers) with 0-20 years of exp.	1 7th grade, inclusive math classroom; 1 3rd grade, inclusive math classroom; 1 2nd grade language arts classroom	Multiple baseline	Training and real-time performance feedback delivered by a peer coach	B	Immed.	Co-teacher	No	Percentage of completed three-term contingency trials	Reliability: 91%-100% Fidelity: 100%	All teachers made immediate, substantial gains in successful three-term contingency trials; these improved were maintained post-intervention and generalized to other settings

TABLE 1
(*Continued*)

Authors	Participants	Context	Design	Intervention	Mode	Timing	Agent	PF isolated	Dependent Variables	Reliability / Fidelity	Findings
Simonsen, Myers, & DeLuca, 2010	3 spec. ed. teachers with 13-16 years of exp.	3 classrooms in an alternative school for students with serious problem behavior; roughly 5-7 students in each class (ages 11-18)	Multiple baseline	Training and performance feedback	M,E,W ,G	Daily	Researchers	Yes	Teacher rate of prompts, OTRs, and praise	Reliability: 83%-99% Fidelity: None reported	Teachers improved use of each practice once performance feedback was implemented
Zoder-Martell et al., 2013	4 gen. ed. and spec. ed. teachers	4 elementary classrooms (grades 3-5) during reading intervention sessions	Counter-balanced A-B-BC-B Design	Training and performance feedback	M,G	Next session	Researchers	Yes	Treatment integrity (reading interventions); students' correct words read per minute	Reliability: 82%-100% Fidelity: 100%	All teachers improved treatment integrity; results indicate graphed feedback alone is sufficient rather than also including meetings

Note: E = Email; M = meeting; G = Graph; W = Written; B = Bug-in-ear; T = Teleconferencing; V = Video

Dependent Variables. The studies targeted a variety of teacher practices as dependent variables, including behaviors targeted to be increased (e.g., OTRs) and decreased (e.g., reprimands). Table 2 includes the frequency with which dependent variables as well as collateral effects were targeted for intervention and measurement. Teacher praise, or positive feedback, was the most commonly targeted teacher practice (*n* = 16), followed by treatment integrity (*n* = 12), and reprimands (*n* = 10). As Cavanaugh (2013) discussed, there is a strong evidence base supporting the effectiveness of performance feedback for increasing teachers' rate of positive feedback (e.g., Allday et al., 2012; Pisacreta, Tincani, Connell, & Axelrod, 2011). Studies often included both praise and reprimands as variables, seeking to simultaneously increase the former while decreasing the latter (e.g., Hawkins & Heflin, 2011).

In one interesting example, researchers applied multi-tiered logic to provide teachers with increasing layers of support, including stronger doses of performance feedback, depending on their response to intervention. Myers, Simonsen, & Sugai (2011) applied this approach predicated on the idea that, like students, not all adults will respond to universal instruction of new skills with some requiring more intensive intervention. When teachers did not respond to whole school professional development, they entered a secondary intervention, which included (a) consultation on specific praise and (b) weekly performance feedback on their rates of specific and general praise and negative interactions with students as well as student behavior. Teachers who did not meet criterion levels of improvement moved to a more intensive intervention, which included a daily performance feedback e-mail and meeting. Each teacher required differential levels

of support to improve their use of praise. While some teachers required the stronger dose of performance feedback, they all increased their rates of praise.

Additionally, there is growing interest in the usefulness of performance feedback to improve treatment integrity; researchers have demonstrated positive effects on treatment integrity for a variety of practices, including academic interventions (Duhon, Mesmer, Gregerson, & Witt, 2009; Gilbertson, Witt, Singletary, & VanDerHeyden, 2007; Gross, Duhon, & Doerksen-Klopp, 2014; Noell et al., 2005; Zoder-Martell et al., 2013), behavior intervention plans (Codding et al., 2005; Codding, Livanis, Pace, & Vaca, 2008; DiGennaro et al., 2005; Gross et al., 2014; Noell et al., 2005; Sanetti, Fallon, & Collier-Meek, 2013;), functional analysis (Machalicek et al., 2010; McKenney, Waldron, & Conroy, 2013), and IEP development (Codding, Skowron, & Pace, 2005).

Table 2

Dependent Variables and Collateral Effects by Frequency of Occurrence

Teacher Behaviors	Frequency	Collateral Effects	Frequency
Praise	16	Student Behavior	11
Treatment Integrity	12	Student Engagement	8
Reprimands	10	Student Acad. Performance	5
OTRs	3		
Three-term Contingency Trials	2		
Low/High Access Strategies	2		
Commands	1		
Co-teaching Models	1		
Accommodations	1		
Instructional Time	1		
Precorrections	1		
Prompts	1		
Transition time	1		

In addition to the primary dependent variables, many studies included measures of collateral effects, primarily to enrich findings by demonstrating whether any changes in teacher behavior correlated with improvements in student behavior. Studies most often included measures of students' disruptive behavior, followed by engagement and academic performance. Generally, these studies demonstrated that when teachers improved their practice, their students experienced academic (e.g., Gilbertson et al., 2007) and behavioral (e.g., Duncan, Dufrene, Sterling, & Tingstrom, 2013) improvements.

Interventions. Performance feedback has rarely been studied as a standalone intervention (e.g., Codding et al., 2005). Rather, performance feedback is frequently one part of a multi-component treatment package, which commonly includes training and may be paired with other components (e.g., goal-setting, coaching, video modeling, etc.). While this is the case, determining whether performance feedback is responsible for an effect requires isolating it from the other treatment components (e.g., having a separate performance feedback only condition in a single-subject study). This is only the case in a little more than half of the included studies; that is, 17 studies isolated performance feedback, controlling for other variables and treatment components. However, 13 studies implemented multi-component treatment packages (e.g., McKenney et al., 2013) or paired training with performance feedback in the same condition (e.g., Allday et al., 2012), which makes it unclear what role performance feedback played in any teacher practice improvements.

Mode. Researchers used a variety of modes to deliver performance feedback to teachers, including meetings, e-mails, graphs, written reports, videos, real-time video conferencing, and bug-in-ear systems. In many cases, researchers employed multiple modes, such as meeting with teachers to show them graphs and video footage of their performance (Hawkins & Heflin, 2011).

While in many cases researchers provided performance feedback during post-observation meetings with teachers, some researchers attempted to simplify by replacing the meeting with a brief e-mail. For example, Allday et al. (2012) provided basic training followed by e-mail performance feedback every third session to four teachers, which improved their use of positive feedback. Further, researchers have sought to amplify the effects of performance feedback by adding visual elements to performance feedback. In one example, Reinke, Lewis-Palmer, and Martin (2007) evaluated the effect of training and VPF on positive feedback of three third grade, general education teachers. At the beginning of each session during treatment, the researchers provided teachers a computer-generated graph showing their frequency of positive feedback from the previous day. The researchers gave no verbal or written feedback with the graphs. After the initial training, the teachers continued to exhibit low rates of positive feedback; however, once VPF was introduced, each teacher increased positive feedback to multiple target students.

Recently, researchers have begun using technology to provide real-time performance feedback privately or at a distance using bug-in-ear systems or Internet-based video conferencing software to provide performance feedback at a distance (Goodman, Brady, Duffy, Scott, & Pollard, 2008; Machalicek et al., 2010; Ploessl &

Rock, 2014; Rock et al., 2012; Rock et al., 2009; Rock et al., 2014; Scheeler et al., 2010).

For example, Machalicek et al. (2010) provided six special education teachers with real-time performance feedback by video conferencing over the Internet. University supervisors observed the teachers via web camera while they were implementing functional analysis conditions with students with challenging behavior; the supervisor would interrupt and provide immediate, corrective feedback when teachers made an error or praise when an action was performed correctly. Each teacher improved their treatment integrity to 100%. Similarly, Rock et al. (2014) provided 14 general and special education teachers with real-time coaching and performance feedback on their use of various instructional practices. Unlike Machalicek et al. who provided feedback that was transmitted through laptop speakers and could be overheard by students, Rock et al. paired video conferencing with bug-in-ear to provide private feedback to teachers who responded with improved instructional practices. Researchers have also had positive effects using similar, real-time feedback in person using bug-in-ear systems to provide feedback privately to teachers during instruction (e.g., Goodman et al., 2008)

Agent. In all but two studies, performance feedback was delivered by the researchers or university-based supervisors rather than internal school personnel. As others have noted, not all schools have access to outside experts, and we cannot be sure whether the effects observed in performance feedback studies will generalize to other agents of feedback, such as administrators or school coaches (e.g., Cavanaugh, 2013).

Two studies have demonstrated that the effects may generalize. In 2010, Scheeler, Congdon, and Stansbery worked with co-teaching dyads (i.e., one general and one special education teacher) in inclusive classrooms. The co-teachers took turns during

47

instruction providing one another with real-time performance feedback using bug-in-ear to improve their completion of three-term contingency trials (i.e., teacher delivers an OTR, student responds, teacher provides positive or corrective feedback). All teachers in the study made immediate, substantial improvements, which were maintained when the treatment was withdrawn and generalized to other contexts (i.e., classrooms, students, content areas). Further, the teachers viewed the intervention positively. Rather than co-teachers, Sanetti, Fallon, and Collier-Meek (2013) trained two internal consultants (a school social worker and a special education teacher) to deliver performance feedback to five general education, middle school teachers on their treatment integrity of implementing classwide behavior management plans. The internal consultants delivered the performance feedback intervention (i.e., a meeting with each teacher to ask about implementation, review a graph of the teacher's performance, discuss specific missed steps, and ask the teacher to focus on the missed steps over the next week) with fairly high—yet, not perfect—fidelity (i.e., 78%-95% of treatment steps were completed). Performance feedback generally had positive effects on teachers' treatment integrity. However, these improvements were short-lived for some teachers, perhaps because the intervention was delivered on a thin schedule (i.e., only when teachers met a criterion).

   Timing. The studies in this review included various timings of performance feedback delivery (see Table 3 for a summary). Performance feedback was most often delivered on the same day or right after an observation session; in most cases, the researcher met with teachers the same day or left written or graphed performance feedback in their mailboxes. In seven studies, however, researchers provided feedback

immediately during the observation, typically using bug-in-ear or video conferencing systems. In six studies, teachers received performance feedback once a week.

Table 3

Frequency of Different Timings of Performance Feedback

Timing	Frequency
Same day	10
Immediate	7
Weekly	6
Before next session	5
After the session	2
Unclear	1

While most of these studies have demonstrated positive effects of performance feedback, none of them directly compared different timings. However, in previous reviews, researchers have weighed in on the importance of timing. While Scheeler et al. (2004) identified immediate feedback as an important attribute of effective performance feedback, in their meta-analysis, Solomon et al. (2012) described contradictory findings, with immediate and deferred feedback having nearly equal effects on teachers' treatment integrity. Solomon et al. suggested that most teachers may be responsive to weekly feedback but some may need more potent doses. Differences between the review of Scheeler et al. and the meta-analysis of Solomon et al. may also be because the former group reviewed studies of immediate feedback where the dependent variables were comprised of discrete teaching behaviors (e.g., teacher praise) whereas Solomon et al. meta-analyzed studies where the primary dependent variable was treatment integrity—

often for the implementation of multi-step academic and behavior intervention plans. It is possible that the timing of feedback is more critical for improving discrete behaviors rather than multi-step plans. Finally, as Solomon et al. discuss, meta-analysis of single-subject research is still developing; researchers have proposed a variety of measures of effect size to summarize single-subject studies (Parker, Vannest, & Davis, 2011). Until the field comes to an agreement on how to determine and interpret effect sizes in single-subject research, it may be more useful to conduct comparative studies that directly compare the effects of different timings on the same dependent variable (e.g., through the use of an alternating treatments design).

Designs. Nearly all of the included studies employed single-subject designs, most commonly a multiple baseline across teachers. Such a design is useful in applied settings with small numbers of participants when the dependent variable is (likely to be) an irreversible behavior (e.g., learning an academic skill) or when withdrawing the treatment is unethical or undesirable (Gast, 2010). This design allows for as many replications of an effect as there are participants, can demonstrate a functional relationship between an intervention and a dependent variable, and can control for a variety of validity threats when employed following conventions.

Some studies used weaker designs, such as non-concurrent multiple baselines (e.g., McKenney et al., 2013) or group designs with no control mechanism (e.g., Rock et al., 2014); regardless, various validity threats were present throughout the literature, some more serious than others. These threats will be discussed briefly.

Several threats were common issues, including sequence effects, history effects, or observer reactivity. One of the most common internal validity threats was the

potential presence of sequence effects. Even when performance feedback was isolated from multi-component treatments, it nearly always followed training, meaning any observed effects may not be due to performance feedback alone. However, this threat is not too concerning, considering performance feedback is typically used in applied settings following training to provide greater support to teachers who need it (e.g., Myers et al., 2011). Generally, researchers controlled for history effects by using a multiple baseline design with overlapping conditions so that participants would serve as controls for one another (Gast, 2010). However, in some cases, researchers did not include enough baseline data points or only staggered introduction of the intervention by one session (e.g., Machalicek et al., 2010), issues which introduce the possibility that other variables are responsible for observed effects. Additionally, it is possible that performance feedback effects are at least in part due to observer reactivity as some researchers have suggested (e.g., DiGennaro-Reed, Codding, Catania, & Maguire, 2010). However, Codding, Livanis, Pace, and Vaca (2008) controlled for observer reactivity by conducting half the observation sessions present in the classroom and half absent (through a two-way mirror), finding no difference; that is, performance feedback effectively improved teacher treatment integrity regardless of observer presence. Additionally, even if observer reactivity could partially explain performance feedback effects, one might consider this simply part of the mechanism upon which the intervention operates—or, perhaps, a feature of the intervention—rather than a validity threat.

Some aspects of the variables and measures make it difficult to interpret the results. For example, dependent variables in the included studies were often poorly

defined or even completely undefined rather than operationalized, which is a construct

validity issue (Shadish et al., 2002). The lack of operational definitions makes it difficult

to understand what was being measured and what effects were caused by feedback.

Similarly, the independent variable was frequently poorly defined, which restricts the

ability of other researchers to replicate studies, which is critical for establishing evidence-

based practices using single-subject research (Horner et al., 2005). Additionally, many

studies relied on permanent products rather than direct observation to determine whether

teacher behavior had improved (e.g., Noell et al., 2005); this brings into question whether

teachers improved their practice or merely improved their reporting on permanent

products. Finally, many studies lacked measures of reliability or fidelity, or they used

insensitive measures (e.g., gross agreement). Excluding these measures construes a

serious threat to internal validity (Gast, 2010).

One other serious issue is that on multiple occasions, studies lacked sufficient

replications of an effect to demonstrate a functional relationship between performance

feedback and teacher behavior; however, the researchers still made positive conclusions

about the effectiveness of performance feedback (e.g., Ploessl & Rock, 2014). Without a

functional relationship, one cannot say with confidence that an independent variable has

caused changes in a dependent variable (Gast, 2010). On these occasions, the researchers

should report inconclusive results or no effect or describe other environmental variables

that may be responsible for observed improvements.

One common limitation to the reviewed studies is that performance feedback was

not isolated from a treatment package, which was the case in 13 studies. In some cases,

researchers made conclusions specifically about the effects of performance feedback

when the design would only allow conclusions about the entire treatment package. In these cases, component analyses are necessary to determine which treatment components are necessary for an effect and to make conclusions about the role of performance feedback in the treatment (see Ward-Horner & Sturmey, 2010).

Finally, one limitation to the evidence base is that many studies did not include a maintenance condition; therefore, it is unclear whether positive effects would be maintained after removal of performance feedback. In the studies that did include a maintenance condition, the overall results have been inconclusive, with effects maintained after the removal of performance feedback in some cases (e.g., Codding et al., 2005; Scheeler et al., 2010) and dropping off in others (e.g., Duhon et al., 2009; Hawkins & Heflin, 2011). Future studies would benefit from including a maintenance condition to determine whether the effects last in the absence of treatment.

Discussion

Overall, there is a growing evidence base in support of performance feedback for teacher behavior change. Researchers have been able to improve a number of important teacher practices, such as praise, OTRs, and treatment integrity, across grade levels and disciplines. In some cases, these effects generalized to other settings and were maintained after treatment withdrawal. Further, there have been apparent collateral effects on student behavior, engagement, and academic performance. Considering these effects, performance feedback is a promising tool for researchers and practitioners alike to improve teacher practice and reduce the research-to-practice gap.

There are several aspects of performance feedback that warrant further study. Thus far, nearly all of the studies in the last decade involving inservice teachers have

used the researchers as the agent of performance feedback. This is a normal stage in the development of evidence-based practices in education research, but eventually more studies need to be conducted wherein performance feedback is implemented by natural participants (e.g., administrators, school coaches, etc.) in schools (Odom et al., 2005). Two studies have included natural participants as the agents of feedback with promising results (Sanetti et al., 2013; Scheeler et al., 2010).

Additionally, studies of performance feedback have involved a variety of modes of feedback delivery, including meetings, e-mails, graphs, written reports, video conferencing, video modeling, and bug-in-ear. In many cases, multiple modes were combined. While all of the aforementioned modes have had positive effects on teacher behavior, there is a lack of comparative studies to determine which modes have the strongest effects. Some of the impetus behind studying specific modes has been to simplify the process of performance feedback to make it a more feasible intervention for busy school personnel (e.g., Allday et al., 2012); improving feasibility is an important aspect of an intervention's social validity. Research is needed that specifically identifies the most effective, yet feasible interventions.

Timing of performance feedback is another area that requires further research. Researchers have seen positive effects of performance feedback when it is only delivered weekly (e.g., Duhon et al., 2013), a schedule which may be more feasible for natural implementers. However, some researchers have suggested that feedback may have stronger effects when delivered immediately (Scheeler et al., 2004). Technological developments have allowed feedback to be delivered in real-time to teachers. Several studies in this review involved performance feedback delivered over the Internet through

54

video conferencing software, in some cases privately through a bug-in-ear device. Such an application of technology has two benefits, including the potentially stronger effects of real-time feedback and the ability of outside experts to provide support to teachers at a distance, which may benefit teachers in remote settings in particular. Several other studies were identified from the past decade using similar technology, but they did not meet inclusion criteria due to being conducted with preservice teachers (Coninx, Kreijns, & Jochems, 2013; Scheeler, Bruno, Grubb, & Seavey, 2009; Scheeler et al., 2006; Scheeler, McKinnon, & Stout, 2011). More research is needed—particularly comparative studies—to determine the effectiveness of real-time feedback using technology. Additionally, while technology-mediated performance feedback is typically delivered verbally, other modes, such as providing graphs in real-time, may have positive effects.

Future research of performance feedback can be strengthened by attending to various design conventions (see Horner et al., 2005). First, researchers should provide thorough participant descriptions, which is particularly important for enhancing the external validity of single-subject studies. Similarly, research articles need to include more thorough, operationalized definitions of independent and dependent variables while also attending to the reliability of measures and fidelity of implementation; these are critical components for improving internal validity. Additionally, researchers should attempt to isolate performance feedback from training and other treatment components to determine what effects are contributed by the feedback. Finally, researchers can improve studies by including maintenance conditions to determine whether performance feedback

has lasting results; toward that point, parametric analyses may be necessary to determine the appropriate dosage of feedback to improve maintenance.

The current, proposed study attends to some of these issues and adds to the literature base in several ways. First, this study will advance knowledge of technology-based performance feedback, including determining the effect of combining visual performance feedback with video conferencing to provide feedback in real-time. Second, this study attends to the design conventions proposed by Horner and his colleagues (2005), enhancing its internal and external validity. Specifically, this study includes: (a) operational definitions of independent and dependent variables; (b) sensitive measures of reliability (i.e., point-by-point, interobserver agreement for each dependent variable) and multiple measures of fidelity (i.e., checklists completed by independent observers for training and performance feedback); (c) a concurrent, multiple baseline design with a minimum of five data points per condition and staggered introduction of both training and performance feedback; (d) performance feedback as a condition isolated from training; (e) direct classroom observations rather than permanent products to measure teacher behavior; (f) a maintenance condition to determine whether any observed effects last in the absence of treatment; and (g) visual and statistical analysis with criteria to determine whether a functional relationship exists between performance feedback and teachers' rates of positive feedback.

CHAPTER 3

METHOD

This study examined the effects of visual performance feedback (VPF), delivered in real-time during instruction, on teachers' rates of positive feedback. I also examined several distal effects, including whether changes occured in the teachers' rates of negative feedback and in students' levels of engagement and rates of disruptive behavior. Intervention was delivered in two phases (i.e., training, then VPF), staggered across teachers in order to isolate and evaluate the effects of real-time VPF. Initially, I delivered training to each teacher on the use of positive feedback to improve students' academic and social performance. After a sufficient period of time to demonstrate stability in teachers' responses to the training, I provided daily, real-time VPF to each teacher during 15-minutes of instruction. Specifically, I used a laptop and wireless screen sharing software to broadcast a live-updating bar graph to an iPad carried by the teachers. I staggered the introduction of each intervention phase, using a multiple baseline across teachers design (Kazdin, 2011) to answer the following research questions:

(1) To what extent is real-time VPF using wireless technology effective for increasing teachers' rates of positive feedback?; and

(2) Do changes in teachers' rates of positive feedback produce any collateral effects (i.e., changes in teachers' negative feedback, student engagement, or student disruption)?

The purpose of this chapter is to describe in detail the procedures that were followed to conduct the study. In subsequent sections I describe the (a) participants and setting; (b) instrumentation; (c) research design; (d) procedures; and (e) analysis of results.

Setting and Participants

    Setting. This study took place in a middle school in a rural school district with nearly 7,000 students in the Southeastern United States. The school had approximately 500 students, nearly 25% of whom received special education services during the time of the study. All students were in sixth or seventh grade. Student ethnicity was 75% Caucasian, 15% Hispanic, 7% African American, and 3% other. Fifty-three percent of the students were eligible for free or reduced lunch. The average student-teacher ratio was 14:1.

    Direct observations of teachers and students were conducted during the school day in the Winter of 2015. The observations took place during 15 minutes of content-area instruction in each teacher's classroom.

    Participant Recruitment. Prior to obtaining school and participant consent, I completed the appropriate submissions to the Institutional Review Board (IRB) to conduct research involving human participants (IRB Tracking Numbers 13.0784 and 13.0785). Then, I obtained consent to participate from a local middle school principal. She initiated communication with all of her general education teachers inviting them to participate in the study to form a pool of potential partcipants. Seven teachers expressed interest in participation; I contacted each of them, provided an overview of the study, and

invited them to participate. All seven agreed to be involved in screening observations and in the study itself if selected for participation.

I conducted screening observations in two stages over the course of three weeks in December to identify both teacher (stage one) and student (stage two) partcipants. During the first stage, I conducted screening observations in all seven teachers' classrooms to identify teacher participants. Screening observations took place daily for one week at different times of the school day to identify the five teachers who consistently used positive feedback at the lowest rates across settings. During these observations, coders used the same protocols and dependent measures described in the instrumentation section. Once I identified the five teachers with the lowest rates of positive feedback relative to the pool of volunteers, I invited them to participate in the full study.

For the second stage of screening, I observed the five participating teachers daily for a week during the same class period. In several cases, teachers identified periods in which they did not want outside influence, so class periods were selected in which the teachers considered it acceptable to have observers present daily for several months. In the initial stage of screening, to identify potential target students I had recorded field notes on students in each class who appeared to have low levels of engagement and high rates of disruptive behavior compared to their classroom peers, accumulating a list of five potential target students in each class. During this stage of screening, based on my qualitative field notes I chose a different target student daily to focus upon for quantitative observations. Based upon these observations, I selected a target student in

each class who had the lowest level of engagement and highest rate of disruptive

behavior relative to the five students who were observed.

Teachers. Direct observations of classrooms over the past several decades have

repeatedly demonstrated that positive feedback is an underutilized practice across school

levels and content areas (e.g., Beaman & Wheldall, 2000; White, 1975). While many—

and, perhaps, all—teachers may benefit from support to improve their use of positive

feedback, this study focused on general education teachers in core content areas (i.e.,

reading, mathematics, science). Researchers have demonstrated the benefits of positive

feedback for students with disabilities and their peers without disabilities (e.g.,

Sutherland & Wehby, 2001; Thompson, Marchant, Anderson, Prater, & Gibb, 2012).

Considering the continuing national trend toward inclusion (National Center on

Educational Restructuring and Inclusion, 1995), general educators are increasingly likely

to teach both populations in the same classroom. Given the many benefits of positive

feedback for both student populations, general education teachers, in particular, may reap

significant outcomes from improved practice.

While three participants are considered sufficient to provide multiple

demonstrations of an effect, four or more are preferable to enhance external validity and

limit the threat of attrition (Gast, 2010). I included five teachers in this study; however, I

decided to withdraw Teacher 5 partway through the study while he was still in baseline

for several reasons. First, the target student in Teacher 5's classroom was removed from

the class permanently during the third week of the study. Second, Teacher 5 was absent

frequently, missing over one-third of the days he was involved in the study. Third, and

most importantly, several weeks into the study, an instructional coach began working

closely with Teacher 5 to improve his use of positive instructional strategies, including positive feedback; their work together involved frequent meetings, goal-setting, and the coach modeling high rates of opportunities to respond and positive feedback in the class in which my observations were taking place. The influence of the instructional coach presented a significant confound, making it impossible to discern clearly the isolated effects of real-time VPF on this teacher's use of positive feedback. Considering these issues, I withdrew Teacher 5 from the study prior to providing any intervention; however, I offered to still meet with the teacher for training and to provide real-time VPF.

Table 4 contains a summary of demographic information as well as the mean frequency of positive feedback during screening for each participating teacher. Teacher 1 was a 44-year-old, Caucasian, 7th grade science teacher with 20 years of teaching experience and National Board Certification in early adolescent science. There were 22 students in the class period in which observations took place. Typical instruction in Teacher 1's classroom during the study included lectures using a Smart Board, interactive discussions, group science experiments, and one-on-one consultation with students during independent or small group work, covering such content as combustion, chemical reactions, and the scientific method.

Teacher 2 was a 45-year-old, Caucasion, 7th grade mathematics teacher with seven years of teaching experience. There were 26 students in the class period in which observations took place. Typical instruction in Teacher 2's classroom during the study involved presenting students with a problem designed to be beyond their skill level and interacting heavily with students to discuss features, challenges, strategies for solving,

and potential solutions for the problem, covering such content as proportions, fractions, and operations involving positive and negative integers.

Teacher 3 was a 45-year-old, Caucasian, 6th grade language arts teacher with 22 years of teaching experience. There were 26 students in her class during the study. There was also a co-teacher in the class who worked primarily one-on-one with students with disabilities in the classroom. Typical instruction in Teacher 3's class included lectures, group discussions, and small group work with teacher consultation, covering such content as writing stories, analyzing and writing evidence-based arguments, and identifying themes.

Teacher 4 was a 43-year-old, Caucasian, 6th grade science teacher with 15 years of teaching experience. There were 28 students in her class during the study. Typical instruction in Teacher 4's class included group discussion, lecture using the Smart Board, and student-led discussion, wherein students developed opportunities to respond for each other and interacted as a group, covering such content as weather, astronomy, gravity, and the scientific method. Additionally, Teacher 4 used a multi-layered classroom management system, which included students earning passes daily to spin a reward wheel at the end of each week and earning classroom money to be spent quarterly on a menu of rewards or a silent auction.

Table 4

Teacher Demographic Information

Teacher	Gender	Age	Years of Teaching Experience	Highest Degree Held	Current Grade Level	Current Content Area	Area of Certification	Mean Frequency of Positive Feedback Per Screening Session
Teacher 1	F	44	20	MA + 30	7th	Science	Elementary Education & Middle School Science	6.4
Teacher 2	F	45	7	MA	7th	Math	Middle School Math & Lang. Arts; Literacy Specialist	6.8
Teacher 3	F	45	22	MA	6th	Language Arts	Middle School Lang. Arts & Social Studies	9.2
Teacher 4	F	43	15	MS	6th	Science	Middle School Science	14.6
Teacher 5	M	34	7	MA + 30	6th	Geography	Social Studies 5-12	6.6

Students. While students were not the primary focus of this study, one student from each classroom was included in the study to help assess the significance of changes in teacher behavior. A primary purpose of increasing teachers' use of positive feedback is to improve student outcomes. Including measures of students' engagement and disruptions allows the possibility of discussing the relationship between teacher and student behavior. However, because this study was not designed to demonstrate experimental control of positive feedback on student behavior, no functional relationship could be demonstrated between the two. Therefore, students were included only to help assess the meaningfulness of the intervention and its subsequent effects on teacher practice.

One student per classroom was identified using the aforementioned screening procedures. However, to protect the confidentiality of students, no identifying information was collected on any of them; only their engagement levels and disruptions were recorded during observations.

Instrumentation

Dependent Measures. Observers collected data during 15-minute direct classroom observations using the Multi-Option Observation System for Experimental Studies (MOOSES) software, which runs on a handheld computer and allows time sequenced data collection and point-by-point interobserver agreement calculation (Tapp, Wehby, Ellis, 1995). MOOSES is customizable data collection software, which allows the development of custom code sets that include frequency and duration variables. Variables are visible on a graphical user interface (see Figure 2); during observations,

coders press a variable's corresponding button when a behavior occurs or a setting needs to be toggled. MOOSES records the timestamp (in seconds) when the button press occurs. At the end of an observation session, data are saved as a text file that is analyzed by the MOOSES software to produce reports on the frequencies, durations, and percentages of occurrence of variables. These data can also be exported to other software programs (e.g., Microsoft Excel, SPSS) for further analysis.
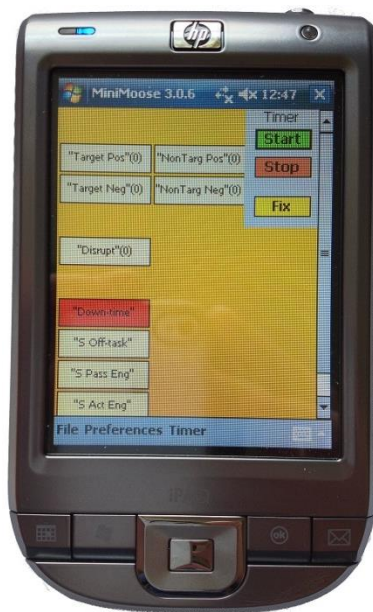
Figure 2. MOOSES codeset displayed on a handheld computer.

I trained a team of observers to collect data on the dependent variables using MOOSES. The training included the following components: (a) review of the coding manual (see Appendix A), including coding procedures, rules, and operational definitions of dependent variables; (b) two practice sessions coding videos to reach a minimum of 80% reliability before beginning the study; and (c) an overview of study logistics (e.g., timeline, interobserver agreement schedule, fidelity checks). One observer had difficulty reaching 80% reliability and despite retraining and practice in live settings, she was

unable to meet the minimum threshold consistently. Therefore, I removed her from the coding team and only used coders during the study who had met or exceeded 80% reliability across variables.

Teacher Behaviors. Operational definitions of teacher behaviors, including examples and non-examples, are provided in Table 5. The proximal dependent variable was the frequency of positive feedback during 15-minute observation sessions. Positive feedback was defined as any instance of the teacher providing a verbal statement or gesture to a student (or group of students) demonstrating approval or affirmation of the student's behavior or response as appropriate or correct (e.g., "Good job;" "Thank you for sitting in your seat;" "That's correct; two plus two is four;" "I like how everyone is on-task right now."). Positive feedback was recorded as *target* (i.e., delivered to the whole class, a subgroup of students including the target student, or the individual target student) or *non-target* (i.e., delivered to a student or group of students, excluding the target student). Collecting data in this way allowed for more detailed analysis of results (e.g., examining the proportion of positive feedback received by the target student in relation to the student's behavior over the course of the study). Target and non-target positive feedback were aggregated to capture the total amount of positive feedback delivered in each session. New positive feedback occurrences were recorded when there was a break of more than five seconds between positive feedback statements, when the teacher provided positive feedback to more than one student consecutively, or when the teacher described a different response in consecutive feedback statements.

Measuring secondary variables can be a useful means of determining possible collateral effects of a treatment (Gast, 2010). These distal effects may provide important

information about the treatment. When scholars have discussed the benefits of positive feedback, they have often suggested that teachers should deliver it at much higher rates than negative feedback (e.g., Trussell, 2008); therefore, changes (or the lack thereof) in negative feedback as positive feedback is targeted for intervention are relevant. Observers recorded *target* and *non-target* negative feedback. Negative feedback was defined as any instance of the teacher providing a verbal statement or gesture to a student (or group of students) demonstrating disapproval or declaring the student's behavior or response to be inappropriate or incorrect (e.g., "Quit stalling and get back to work;" "Stop talking;" "That's incorrect; two plus two is not five"). Observers counted new negative feedback occurrences using the same procedures employed for positive feedback.

Table 5

Operational Definitions of Teacher Behaviors

Dependent Variable	Operational Definitions
Positive Feedback (Target)	Teacher gives the whole class, a group of students including the target, or the individual target student feedback on an academic or social behavior that indicates the behavior/response is correct. *Examples*: • The teacher addresses the entire class, saying, "Thank you for working quietly on your word problems." • The teacher addresses a small group of students (that includes the target student) who are working on a project: "You all are working well together; good work". *Non-example*: • "Yes, Geneva is correct" to an individual, non-target student (Code as Non-target Positive)
Positive Feedback (Non-target)	The teacher gives a non-target, individual student or group of non-target students feedback on an academic or social behavior that indicates the behavior/response is correct. *Example*:

	• The target student is in Group A, and the teacher says, "Everybody in Group B is doing great work." *Non-example:* • The teacher addresses the entire class, "Everybody is doing well following our classroom expectations today." (Code as Target Positive)
Negative Feedback (Target)	The teacher informs the target student (or a group including the target) that a behavior/response is incorrect, indicating the student should stop engaging in that response. *Examples:* • The teacher addresses the target student when off-task: "Sam, quit wasting time and get back to work." • A pair of students that includes the target are presenting their answer for a word problem to the class; the teacher says, "No, that's not the procedure we use for this type of problem." *Non-example:* • The teacher approaches the target student when working on essay, offering a direction: "Try hard on this one; it's going in your portfolio." (Do not code)
Negative Feedback (Non-target)	The teacher informs a non-target, individual student (or group of non-target students) that a behavior/response is incorrect, indicating they should stop. *Examples:* • The target student is Susan; the teacher says, "No, Devon, that's incorrect; we need to rewrite this sentence." • The target student is sitting in the front row, and the teacher says, "Everybody in the back row needs to stop talking and get back on-task." *Non-example:* • The teacher addresses the whole class, "Nobody is following directions."

Student Behaviors. In addition to teacher feedback, observers recorded target student disruptions and engagement levels as additional secondary measures (see Table 6). Disruptions were defined as behavior that does or potentially could interrupt the lesson or distract others, including being out of seat, making noises, calling out responses or comments without being called on, and destroying items. Observers coded new

68

disruption events if the topography changed (e.g., talking out, then tapping), a five second

pause occured between events, or the teacher responded to the behavior and the student

engaged in it again.

Engagement level was coded on four levels, including active engagement (i.e.,

student was actively engaging with instructional content via choral response, raising

hand, responding to teacher instruction, writing, reading, or otherwise completing

assigned task), passive engagement (i.e., student was attending to instruction by physical

orientation toward teacher or instructional materials or peer during cooperative work),

off-task (i.e., student was neither actively nor passively engaged and is not following

current classroom expectations), and down-time (i.e., the teacher provided no academic

expectations to the target student, so the student could not be actively or passively

engaged). When a student switched from one engagement level to another (e.g., from

being off-task to being actively engaged in a task), coders counted down five seconds

before toggling the code in order to be sure the student was engaging differently and to

improve reliability in situations when students rapidly switched levels. Engagement level

was recorded as a duration code and converted to the percentage of time the student was

active, passive, off-task, or in down-time. Additionally, active and passive engagement

were combined to compute each student's total engagement level.

Table 6

Operational Definitions of Student Behaviors

Dependent Variable	Operational Definitions
Disruption	The target student displays behavior that violates classroom rules or teacher expectations, which does or potentially could interrupt the lesson or distract other students, including being out of seat, making noises, calling out responses or comments without being called on, and destroying items. Behaviors can range from low intensity (out of seat to

sharpen pencil) to high intensity (making derogatory statements or destroying property).

Examples:
• The target student calls out a question for the teacher when the teacher's current classroom expectation is for students to raise their hands.
• The target student leaves assigned area without permission and begins talking to another student in the class.

Non-example:
• The target student is talking with a peer about a task during independent work when the teacher has expressed that students are allowed to consult with their peers for assistance.

| Active Engagement | Student is actively engaging with instructional content via choral response, raising hand, responding to teacher instruction, writing, reading, or otherwise completing assigned task. |

Examples:
• Target student is writing on an assigned worksheet page.
• Target student is reading out loud with the class when directed to do so, following along with finger or eyes in text.
• Target student is working on the computer assigned task from the teacher.

Non-examples:
• Student is watching or listening only.
• Target student is oriented towards the teacher or speaker and appears to be following instruction or course of events.

| Passive Engagement | Student is passively attending to instruction by orientation to teacher or peer if appropriate. |

Examples:
• Student is listening to lecture or watching presentation.
• Student looks and listens to another student called on.
• Target student is oriented towards the teacher or speaker and appears to
be following instruction or course of events.

Non-examples:
• Student has head down and is not looking at teacher
• Student looks and listens to a student talking off-task

| Off-task | Student is neither actively engaged nor looking at the teacher or instructional materials. |

Examples:
• Target student is out of seat without permission.
• Target student looking away from the teacher or instructional materials.

	• Target student not complying with a request (e.g., to open books, to look at board, to write an answer and does not appear to be thinking about the answer to write)
	Non-examples: • Student looks away and talks to peer for less than 5 seconds. • Student silently watches video
Down-time	There are no academic expectations of the target student or group target student is part of.
	Examples: • At beginning or end of class no instruction has started and students are talking amongst themselves • Target student finishes an assignment or test and lays their head down as nothing else has been asked of him/her. • Teacher is instructing and steps away to answer phone or speak to someone at door without informing students of what to do ("work on… while I attend to this")
	Non-examples: • Teacher is lecturing and student is sleeping or has head down • Teacher is instructing and steps away to answer phone yet tells class to "go ahead and get a start on the project and I'll be right back"

Interobserver Agreement. A second observer coded 33% of sessions across all participants to determine interobserver agreement (IOA) to maintain reliability and prevent observer drift. The MOOSES program calculates IOA using point-by-point agreement and a 5-second window. Agreement occured if the observers coded the same variable within 5 seconds of each other. The percentage of IOA was calculated by dividing the number of agreements by the sum of agreements and disagreements. Overall IOA and ranges for all dependent variables are reported in Table 7, and overall IOA by teacher and code-type are reported in Table 8. Overall agreement was 93% for frequency codes (i.e., target and non-target positive and negative feedback, disruptions) and 97% for duration codes (i.e., active, passive, off-task, and down-time). In virtually all cases that agreement for a particular variable fell below 80% in a reliability session, it appeared to

be due to low frequency of occurrence (e.g., a disruption occurred only once in a session, and one coder missed it, resulting in 0% agreement for that variable that day).

Table 7

Reliability by Variable

Frequency Codes	Reliability (Range)	Duration Codes	Reliability (Range)
Positive Feedback – Target	.94 (.67-1.00)	Active	.97 (.47-1.00)
Positive Feedback – Non-target	.95 (.67-1.00)	Passive	.98 (.85-1.00)
Negative Feedback – Target	1.00 (1.00-1.00)	Off-Task	.96 (0-1.00)
Negative Feedback – Non-target	.93 (0-1.00)	Down-time	.98 (.76-1.00)
Disruption	.89 (0-1.00)		
Overall by Code Type	.93		.97

Table 8

Overall Reliability by Teacher and Code-type

Teacher	Frequency Codes	Duration Codes
Teacher 1	.92	.96
Teacher 2	.93	.98
Teacher 3	.90	.95
Teacher 4	.95	.97

Social Validity. Social validity involves the utility, meaningfulness, and feasibility of the goals, procedures, and effects of an intervention (Wolf, 1978). I assessed teachers' perceptions of the social validity of the intervention using the *Intervention Rating Profile-15* (IRP-15; Martens, Witt, Elliott, & Darveaux, 1985). The IRP-15 is a survey that measures the general acceptability of an intervention using 15 items (e.g., "I would suggest the use of this intervention to other teachers;" "This intervention should prove effective in changing the child's problem behavior"). Participants responded to each item using a 6-point Likert-type scale (i.e., from 1– strongly disagree to 6–strongly agree). The IRP has high internal consistency (Cronbach's alpha = .98) with higher scores indicating higher acceptability of the intervention. I adapted the IRP-15, changing the wording of some items to better align with the intervention (see Appendix D for the adapted IRP-15). I also added several open-ended questions (e.g., "How would you describe the experience of receiving immediate, visual performance feedback;" "How did you feel about carrying and using the iPad?").

Study Design

This study incorporated a multiple baseline across teachers design (Gast, 2010) with the intervention introduced to each teacher on a staggered timeline. I chose this design rather than a withdrawal design because teachers received training on positive feedback, and potential learning indicates that the behavior (i.e., positive feedback) may not be reversible. When a behavior is irreversible, a multiple baseline design is a useful alternative for demonstrating experimental control. In this design, each teacher serves both as his/her own control and as a control for the other teachers. Demonstration of a

functional relation between VPF and frequency of positive feedback would occur when: (a) a teacher demonstrates a stable level/trend of positive feedback prior to introduction of the intervention; (b) an immediate change in level/trend of positive feedback occurs when the intervention is introduced; and (c) teachers who have not yet received intervention continue to exhibit stable positive feedback. Further, with four participants, this design provided the opportunity for four inter-subject demonstrations of effect.

Procedures

Pre-baseline. Prior to beginning the initial screening, observers conducted history training for two days (i.e., they attended each class for 15 minutes but did not collect data) to account for adaptation or reactivity so that participants' behavior would be minimally impacted by the presence of observers. Also, prior to baseline, both screening stages were completed.

Baseline. The study began with a minimum of five days of baseline data collection. During this time, teachers were asked to engage in their typical practice. Observers coded during 15 minutes of instruction. Baseline conditions continued until teachers demonstrated stable responding (see Gast, 2010). Once teachers were in baseline for at least five days and had demonstrated stability for the final three data points, they were eligible to receive training. Teachers with stable responding were moved to the next condition in random order and a staggered format (i.e., the first participant moved to Intervention Phase I, while the other three remained in baseline; every three sessions, another teacher with stable baseline responding progressed to the next condition).

Intervention Phase I: Training. Following baseline conditions, I delivered scripted training on positive feedback (see Appendix B) to each individual teacher, which included: (a) providing a definition of positive feedback; (b) describing how positive feedback operates on behavioral principles; (c) explaining the benefits of positive feedback; (d) explaining the characteristics of effective feedback (i.e., contingent, specific, immediate, authentic, and frequent); (e) sharing a minimum of five examples of positive feedback; and (f) providing an opportunity to ask questions. The training did not address negative feedback other than sharing that researchers have suggested providing positive feedback at higher rates than negative feedback. Following the training, the teachers were instructed to teach as normal. Once a teacher had been in this intervention phase for a minimum of five days and the final three data points were stable, the teacher entered the next intervention phase.

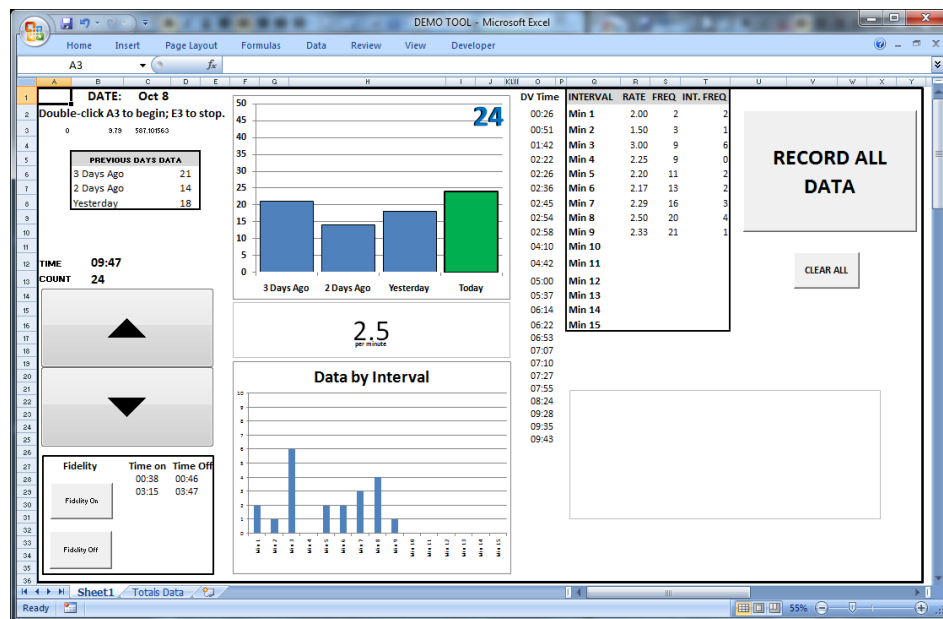

Figure 3. Excel Workbook for recording and transmitting data for VPF.

Intervention Phase II: VPF. Following the training phase, teachers began to receive real-time VPF on their use of positive feedback. VPF was separated from the training

phase to isolate its effects, controlling for the training. Prior to the first VPF session, I delivered a brief training on the intervention to each individual teacher, which included: (a) explaining the benefits of performance feedback; (b) showing a bar graph of the teacher's positive feedback during baseline; (c) demonstrating and explaining how to use and interpret VPF on the iPad; (d) asking the teacher to use the iPad daily until notified otherwise; and (e) providing an opportunity to ask questions.

During this phase, I provided real-time VPF for teachers, giving live updates on the total amount of positive feedback delivered during each session. Each time the teacher delivered positive feedback, I recorded the feedback in a Microsoft Excel workbook on a laptop computer. The workbook was programmed to run multiple macros that I programmed using Visual Basic for Applications to create several features, including a 15-minute timer, a button for recording positive feedback count and time-stamps, a button to record and save a copy of all data obtained in a session, and a bar graph linked to the positive feedback count (see Figure 3). The bar graph was transmitted wirelessly to an Apple iPad using the Air Display application ($9.99). Air Display allows a user to mirror or extend a computer display onto an Apple device using a wireless Internet or ad hoc network connection. Using Air Display, I extended the Excel window across the laptop and iPad screens, so the teachers were able to see the bar graph, which included data from the previous three days and the current session (see Figure 4). The previous days' bars were blue with a black outline and the current session green with a black outline and labeled with its value to focus the teachers' attention on their current performance. I asked each teacher to carry the iPad and to keep it within view throughout this phase.
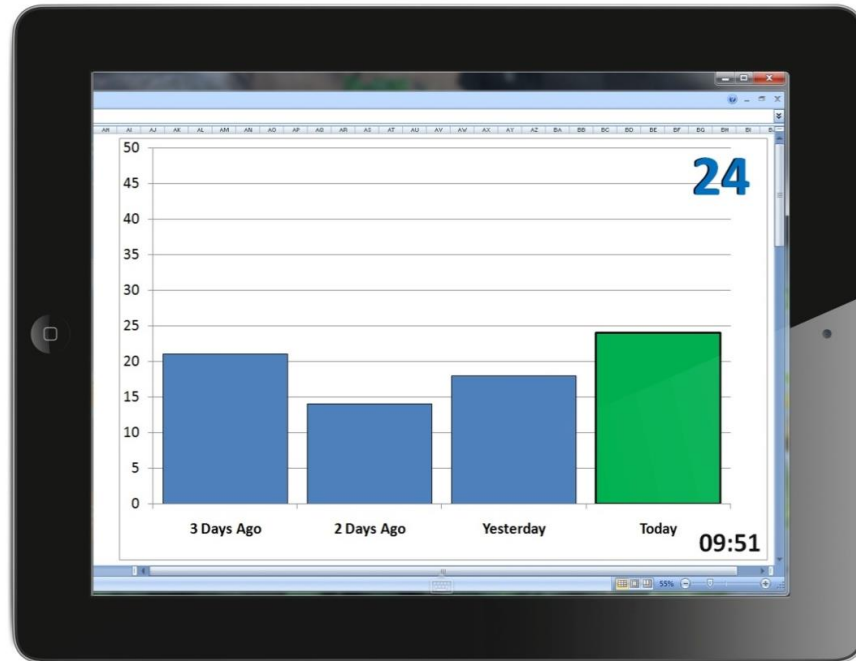
Figure 4.VPF provided on the iPad using the Air Display application.

Maintenance. Following 10 days in the VPF phase, I withdrew the intervention for three days. Additionally, an observer came weekly until the conclusion of the study to conduct maintenance probes to determine whether improvements in teacher positive feedback were maintained over time in the absence of VPF and frequent observation.

Treatment Fidelity. Both the training on positive feedback and the training on VPF were recorded with a video camera. A second observer viewed the footage and completed training checklists (items a – f in the Intervention Phase I section; items a – e in the Intervention Phase II section). Furthermore, during 100% of treatment sessions, the coder completed a VPF checklist to ensure the treatment was provided fully. Procedural fidelity of the trainings and VPF was calculated by dividing the number of observed training components by the number of planned training components; fidelity was 100% for both trainings and for all VPF sessions. All of the fidelity checklists can be found in Appendix C.

Analysis

      Visual Analysis. I used visual analysis to determine whether there was a functional relation between VPF and positive feedback. I created a line graph of the data, and analyzed six key features of the data: (1) level, (2) trend, (3) variability, (4) immediacy of the effect, (5) overlap, and (6) consistency of data patterns across similar phases (Kratochwill et al., 2010). I compared adjacent conditions, attending to these features, to determine whether any intervention effects were present.

      Additionally, I visually analyzed and conducted mean comparisons of secondary teacher and student variables. I created line graphs of teacher negative feedback and bar graphs of student engagement levels and disruptions.

      Statistical Analysis. As a measure of effect size, I calculated the Tau-U, which is a statistical measure of nonoverlap and trend with several benefits (Parker, Vannest, & Davis, 2010; Parker, Vannest, Davis, & Sauber, 2011). Specifically, Tau-U can correct for positive baseline trend, which is not possible with many common measures (e.g., percentage of nonoverlapping data) of effect size in single-subject research. Furthermore, Tau-U has strong statistical power, allowing it to detect even small effect sizes. Tau-U involves pairwise comparison of all data points in baseline and treatment conditions, creating a statistic between 0.00 and 1.00 that represents the percentage of improvement between conditions (Parker et al., 2011). While standard guidelines for interpreting Tau-U have not been established, because Tau-U is similar to but more conservative than Nonoverlap of All Pairs (Parker & Vannest, 2009), researchers have considered guidelines for the latter statistic to be sufficient (e.g., O'Handley, Radley, & Whipple, 2015; Radley, Dart, Furlow, & Ness, 2015). I used those guidelines for

interpreting Tau-U, so I considered effect sizes between 0.00 and 0.65 to be weak effects, between 0.66 and 0.91 to be moderate effects, and between 0.92 and 1.00 to be strong effects (Parker & Vannest, 2009). I used the web-based calculator hosted on the Single Case Research website (www.singlecaseresearch.org) to compute Tau-U (Vannest, Parker, & Gonen, 2011). I compared adjacent conditions only (i.e., baseline to post-training and post-training to VPF) for each participant, correcting for therapeutic trend when it was greater than .40 as recommended by Parker et al. (2011).

     Social Validity. I also examined social validity results from the Likert survey. Surveys results for each item were aggregated to provide an overall summary of teachers' responses to each item.

CHAPTER 4

RESULTS

The purpose of this chapter is to present the results of the implementation of

training and real-time VPF on the primary and secondary dependent variables in this

study. First, I report results from visual and statistical analyses of teacher behaviors,

including positive and negative feedback, across all study conditions, including baseline,

post-training, VPF, and maintenance. Additionally, I provide results for student

behaviors, including engagement levels and disruptive behaviors, across conditions.

Finally, I present the social validity results from the adapted IRP-15. Interpretations and

implications of the findings will be discussed in the final chapter.

Teacher Behaviors

The primary dependent variable for this study was total positive feedback, which

was a composite of target and non-target positive feedback. I collected additional data on

teachers' frequency of total negative feedback (also a composite of target and non-target).

In this section, I provide the results for each of these dependent variables for each

teacher, including: (a) visual analysis results, such as level, trend, and stability; (b) means

and ranges in each condition; (c) separate effect size estimates (i.e., Tau-U) of the effects

of training and of real-time VPF on total positive feedback; (d) teachers' mean ratios of

positive to negative feedback in each condition; and (e) separate omnibus effect sizes for

training and real-time VPF across all participants. Figure 5 contains graphs of all

teachers' total frequencies of positive and negative feedback across conditions.
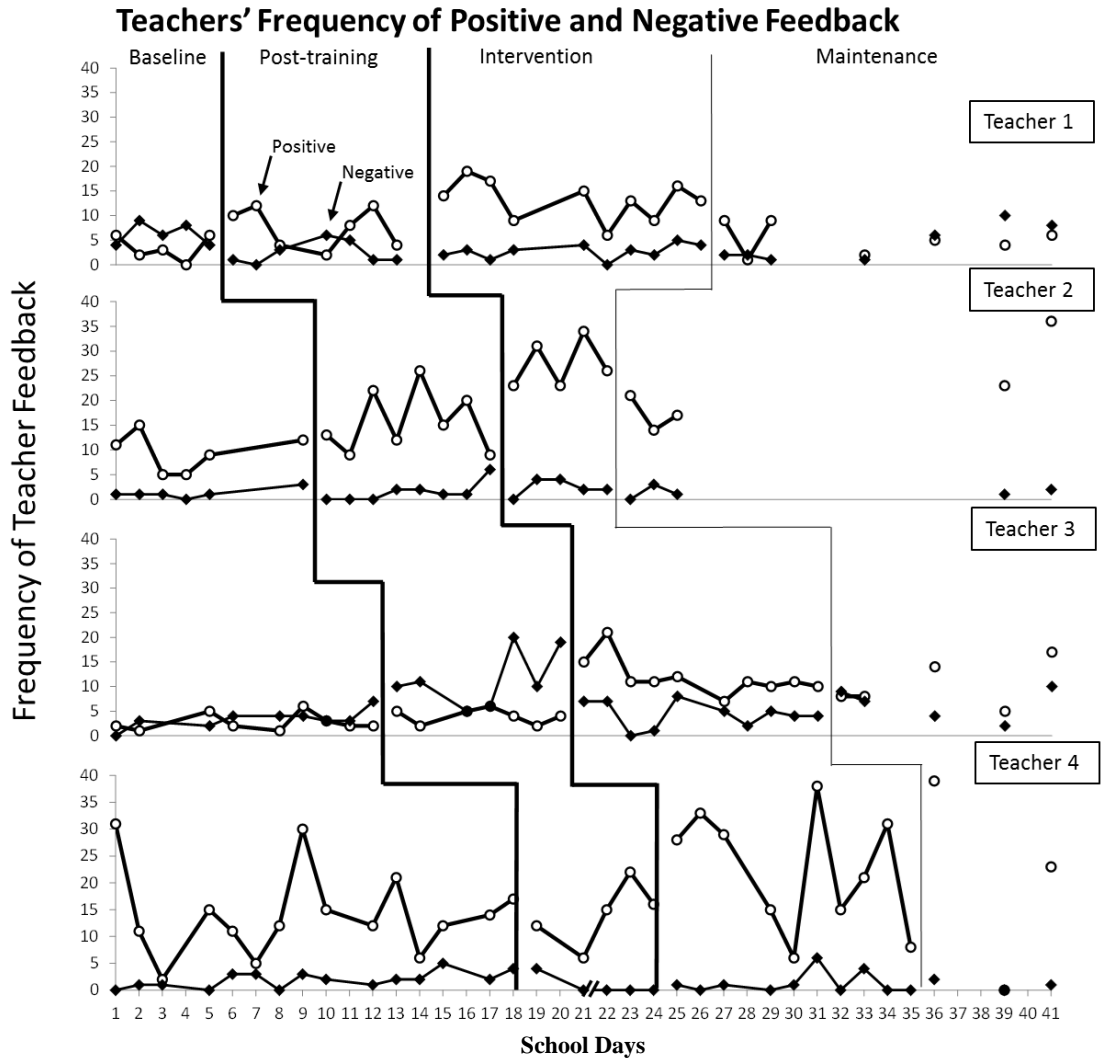
Figure 5. Teacher frequency of positive and negative feedback. A scale break is present to indicate four school days without any observations due to the combination of a holiday and snow days.

Teacher 1

During the baseline phase, Teacher 1's mean frequency of total positive feedback was 3.4 (range of 0 to 6) with nearly zero trend prior to training. Following positive feedback training, the mean frequency of total positive feedback increased to 7.4 (range of 2 to 12) with an initial increase in level but also a corresponding increase in variability. Visual analysis revealed a high degree of overlap between the baseline and post-training conditions. The effect size of training on total positive feedback was weak (Tau-U = .57, 90% CI = 0.00-1.00, $p > .05$). During the VPF condition, the mean frequency of total positive feedback increased to 13.1 (range of 6 to 19). Visual analysis revealed an initial increase in level with a contratherapeutic trend for the first half of the condition and a therapeutic trend for the latter half. The effect size of VPF on total positive feedback was moderate (Tau-U = .71, 90% CI = .23-1.00, $p < .05$). Following the withdrawal of VPF during the maintenance condition, the mean frequency of total positive feedback dropped to 5.1 (range of 1 to 9).

Teacher 1's mean frequency of total negative feedback during the baseline condition was 6.2 (range of 4 to 9) with relatively stable data and a slight therapeutic trend prior to training. Post-training, Teacher 1's mean frequency of total negative feedback decreased to 2.4 (range of 0 to 6). During the VPF condition, Teacher 1 demonstrated similar responding with a mean frequency of 2.7 (range of 0 to 5). During the maintenance condition, total negative feedback initially decreased in level but probes indicated a contratherapeutic trend with a mean of 4.3 (range of 1 to 10).

During the baseline condition, Teacher 1's mean positive to negative feedback ratio was 0.6:1, indicating that she used negative feedback nearly twice as often as

positive feedback. Following training, this ratio improved to 3.1:1. During the VPF condition, she demonstrated her highest ratios of positive to negative feedback with a mean of 4.9:1. After VPF was withdrawn, this ratio decreased to 1.2:1.

Teacher 2

During the baseline phase, Teacher 2's mean frequency of total positive feedback was 9.5 (range of 5 to 15) with a slight therapeutic trend prior to training. Following positive feedback training, Teacher 2's mean frequency of total positive feedback increased to 15.8 (range of 9 to 26) with a delayed increase in level and an increase in variability. Visual analysis revealed a moderate overlap between the baseline and post-training conditions and a curvilinear trend (i.e. therapeutic for the first half of the condition and contratherapeutic for the latter). The effect size of training on total positive feedback was weak (Tau-U = .58, 90% CI = 0.05-1.00, $p > .05$). During the VPF condition, the mean frequency of total positive feedback increased to 27.4 (range of 23 to 34). Visual analysis revealed an immediate improvement in level and trend. The effect size of VPF on total positive feedback was moderate (Tau-U = .88, 90% CI = .31-1.00, $p < .05$). Several days into the VPF condition, Teacher 2 revealed that within one week she would have to leave school for an indeterminate length of time for medical reasons. Because of her improvement in the use of positive feedback during the VPF condition and her sudden need to exit the study, I decided to withdraw VPF sooner than planned to determine her responding in the absence of intervention. Additionally, she returned to school following four weeks of absence, and I was able to capture two maintenance probes. Following the withdrawal of VPF during the maintenance condition, Teacher 2's

mean frequency of total positive feedback decreased to 22.2 (range of 14 to 36) with her highest frequency of positive feedback occurring on the final day of the study.

Teacher 2's mean frequency of total negative feedback during the baseline condition was 1.2 (range of 0 to 3) with relatively stable data and a slight contratherapeutic trend prior to training. Post-training, Teacher 2's mean frequency of total negative feedback increased to 1.5 (range of 0 to 6). During the VPF condition, the mean frequency of total negative feedback increased to 2.4 (range of 0 to 4). During the maintenance condition, total negative feedback decreased to mean of 1.4 (range of 0 to 3).

During the baseline condition, Teacher 2's mean positive to negative feedback ratio was 8.1:1, indicating that she tended to use positive feedback eight times more often than negative feedback. Following training, this ratio increased to 10.5:1. During the VPF condition, this ratio increased to 11.4:1. After VPF was withdrawn, Teacher 2 used her highest ratios of positive to negative feedback with a mean of 15.9:1.

Teacher 3

During the baseline phase, Teacher 3's mean frequency of total positive feedback was 2.7 (range of 1 to 6) with zero trend prior to training. Following positive feedback training, Teacher 3's mean frequency of total positive feedback increased to 4.0 (range of 2 to 6). Visual analysis revealed zero trend and complete overlap between the baseline and post-training conditions. The effect size of training on total positive feedback was weak (Tau-U = .44, 90% CI = 0.00-.94, $p > .05$). During the VPF condition, the mean frequency of total positive feedback increased to 11.9 (range of 7 to 21). Visual analysis revealed an immediate improvement in level; while Teacher 3's frequency of total

positive feedback decreased following the first two days of VPF, her responding was very stable with zero trend and remained at a higher level than in the prior condition. The effect size of VPF on total positive feedback was strong (Tau-U = 1.00, 90% CI = .52-1.00, $p < .05$). Following the withdrawal of VPF during the maintenance condition, Teacher 3's mean frequency of total positive feedback decreased to 10.4 (range of 5 to 17).

Teacher 3's mean frequency of total negative feedback during the baseline condition was 3.3 (range of 0 to 7) with relatively stable data and a slight contratherapeutic trend prior to training. Post-training, Teacher 3's mean frequency of total negative feedback increased to 11.6 (range of 5 to 20) with greater variability and an overall contratherapeutic trend. During the VPF condition, the mean frequency of total negative feedback decreased to 4.3 (range of 0 to 8) with an immediate change in level, an overall therapeutic trend, and greater stability in the latter half of the condition. During the maintenance condition, total negative feedback increased to mean of 6.4 (range of 2 to 10).

During the baseline condition, Teacher 3's mean positive to negative feedback ratio was 0.8:1, indicating that she tended to use negative feedback more often than positive feedback. Following training, this ratio decreased to 0.3:1, indicating that Teacher 3 was delivering negative feedback at more than three times the rate of positive feedback. During the VPF condition, this ratio increased to 2.8:1, a near reversal from the prior condition. After VPF was withdrawn, Teacher 3's mean positive to negative feedback ratio decreased to 1.6:1.

Teacher 4

During the baseline phase, Teacher 4's mean frequency of total positive feedback was 14.3 (range of 2 to 31) with high variability and a slight therapeutic trend prior to training. Following positive feedback training, Teacher 4's mean frequency of total positive feedback decreased slightly to 14.2 (range of 6 to 22). Visual analysis revealed a slight therapeutic trend and complete overlap between the baseline and post-training conditions. The effect size of training on total positive feedback was weak (Tau-U = .15, 90% CI = -.36-0.65, $p > .05$). During the VPF condition, the mean frequency of total positive feedback increased to 22.4 (range of 6 to 38). Visual analysis revealed an immediate initial improvement in level followed by a contratherapeutic trend and highly variable data throughout the condition; additionally, half of the data points overlapped with data in the prior condition. Because there was positive trend in the post-training condition (Tau-U = .60), I corrected the baseline using the web-based calculator, reducing the effect size to a more conservative value; the adjusted effect size of VPF on total positive feedback was weak (Tau-U = .30, 90% CI = 0.00-.84, $p > .05$). Following the withdrawal of VPF during the maintenance condition, Teacher 4's mean frequency of total positive feedback decreased to 20.7 (range of 0 to 39).

Teacher 4's mean frequency of total negative feedback during the baseline condition was 1.9 (range of 0 to 5) with relatively stable data and an overall slightly contratherapeutic trend. Post-training, Teacher 4's mean frequency of total negative feedback decreased to 0.8 (range of 0 to 4), falling to zero occurrences per session for the last four sessions of the condition. During the VPF condition, the mean frequency of total negative feedback increased to 1.3 (range of 0 to 6); for eight of the 10 VPF

sessions, there were only 1 or fewer occurences of negative feedback, but the mean was increased by two days with higher frequencies (4 and 6 occurrences, respectively). During the maintenance condition, total negative feedback decreased to mean of 1.0 (range of 0 to 2).

During the baseline condition, Teacher 4's mean positive to negative feedback ratio was 7.4:1, indicating that she tended to deliver positive feedback over seven times more often than negative feedback. Following training, this ratio increased to 17.8:1. During the VPF condition, this ratio slightly decreased to 17.2:1. After VPF was withdrawn, Teacher 3's mean positive to negative feedback ratio increased to 20.7:1.

Overall Effect Size Estimates

I computed omnibus effect sizes for both training and VPF on teachers' total positive feedback by combining the comparisons between adjacent phases across all teachers using the web-based calculator. The overall effect size of training on teachers' total positive feedback was weak (Tau-U = .43, 95% CI = .12-.74, $p < .05$). The overall effect size of real-time VPF on teachers' total positive feedback was moderate (Tau-U = .73, 95% CI = .42-1.00, $p < .05$), indicating that across all participants there was an overall 73% improvement in total positive feedback when they received VPF.
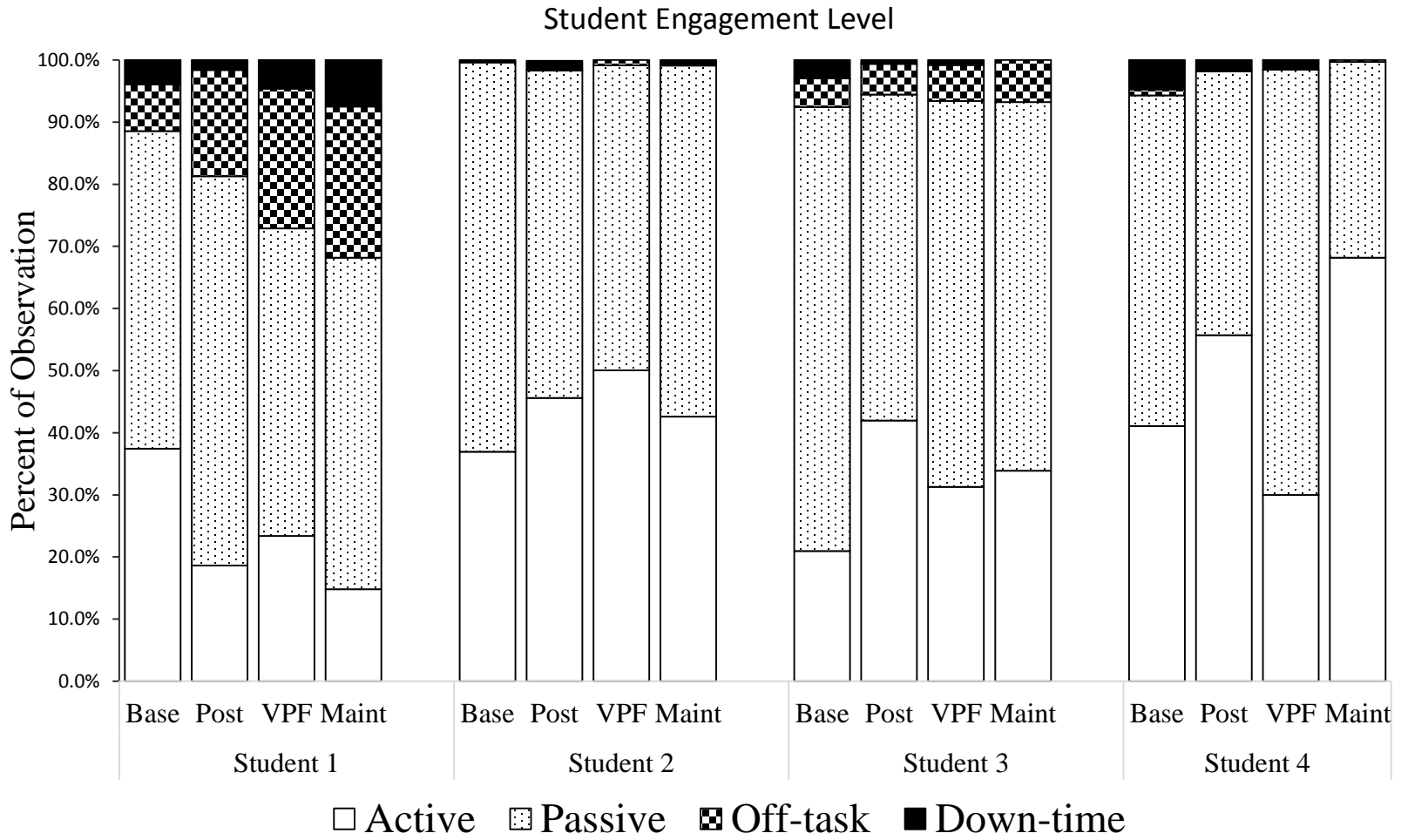
Figure 6. Mean target student engagement levels by condition.

Target Student Disruptive Behavior
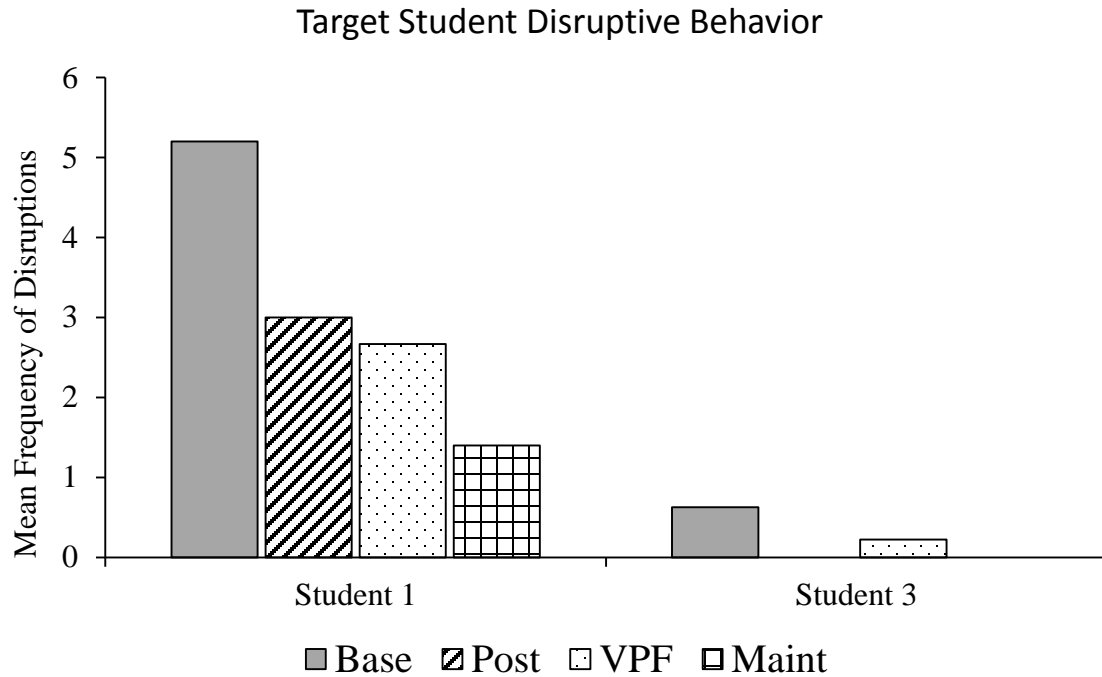
Figure 7. Mean frequency of disruptive behavior engaged in by Student 1 and Student 3 across conditions.

Student Behaviors

Student behaviors, including engagement level and disruptive behavior, served as secondary dependent variables in this study to examine potential distal effects related to changes in teacher practice. Because this study was designed to demonstrate experimental control of the intervention on teacher—and not student—behavior, I did not make experimental decisions (e.g., when to introduce training and VPF to each tier) based upon student engagement or disruption. Student behaviors across conditions serve as useful, additional information, but no causal conclusions can be made regarding the effects of teacher training, real-time VPF, or changes in teacher behavior on student engagement or disruptions. Considering the secondary nature of these data, I present summary information, including: (a) bar graphs; and (b) means and ranges of target

students' total engagement level (computed by combining active and passive engagement) and disruptions across conditions for each student. Figure 6 contains students' mean engagement levels across conditions broken down by level of engagement (i.e., mean percentage of time that students were actively engaged, passively engaged, or off-task or that down-time occurred). Additionally, Figure 7 provides mean frequencies of disruptive behavior for Students 1 and 3 only (Students 2 and 4 did not engage in disruptive behavior throughout the study). Finally, to aid in the interpretation and discussion of student data, Figure 8 presents the mean proportion of total positive feedback delivered specifically to target students—or groups that included them—across study conditions.

Student 1

During baseline conditions, Student 1's overall engagement level was fairly stable with a therapeutic trend and a mean total engagement of 88.6% (range of 73.3% to 97.2%) of the time. During post-training, Student 1's overall engagement level was highly variable, decreasing to a mean total engagement level of 81.3% (range of 61.1% to 100%) of the time. During the VPF condition, the mean total engagement level further decreased to 72.9% (range of 33.3% to 96.3%) of the time with continued variability. When the intervention was withdrawn, Student 1's mean total engagement level decreased to 68.1% (range of 29.4% to 89.1%).

Student 1's mean frequency of disruptive behavior during baseline was highly variable with a mean of 5.2 (range of 0 to 11). During the post-training condition, disruptive behavior continued to be variable with a lower mean occurrence of 3 (range of 0 to 9). During the VPF condition, disruptive behavior was less variable with a mean of

90

2.7 (range of 0 to 7). Following withdrawal of VPF, disruptive behavior further

decreased to a mean of 1.4 (range of 0 to 4) with a contratherapeutic trend prior to the

conclusion of the study.

During baseline, Teacher 1 delivered a mean of 37.5% (range of 16.7% to 50%)

of her positive feedback to Student 1. Following training, Teacher 1 delivered a lower

proportion of positive feedback to Student 1 with a mean of 25.7% (range of 0.0% to

75.0%). During the VPF condition, Teacher 1 further reduced the proportion of positive

feedback delivered to Student 1 with a mean of 9.7% (range of 0.0% to 38.5%). During

the maintenance condition, Teacher 1 delivered a lower proportion of positive feedback

to Student 1 with a mean of 4.8% (range of 0.0% to 33.3%).

Proportion of Feedback Delivered to Target
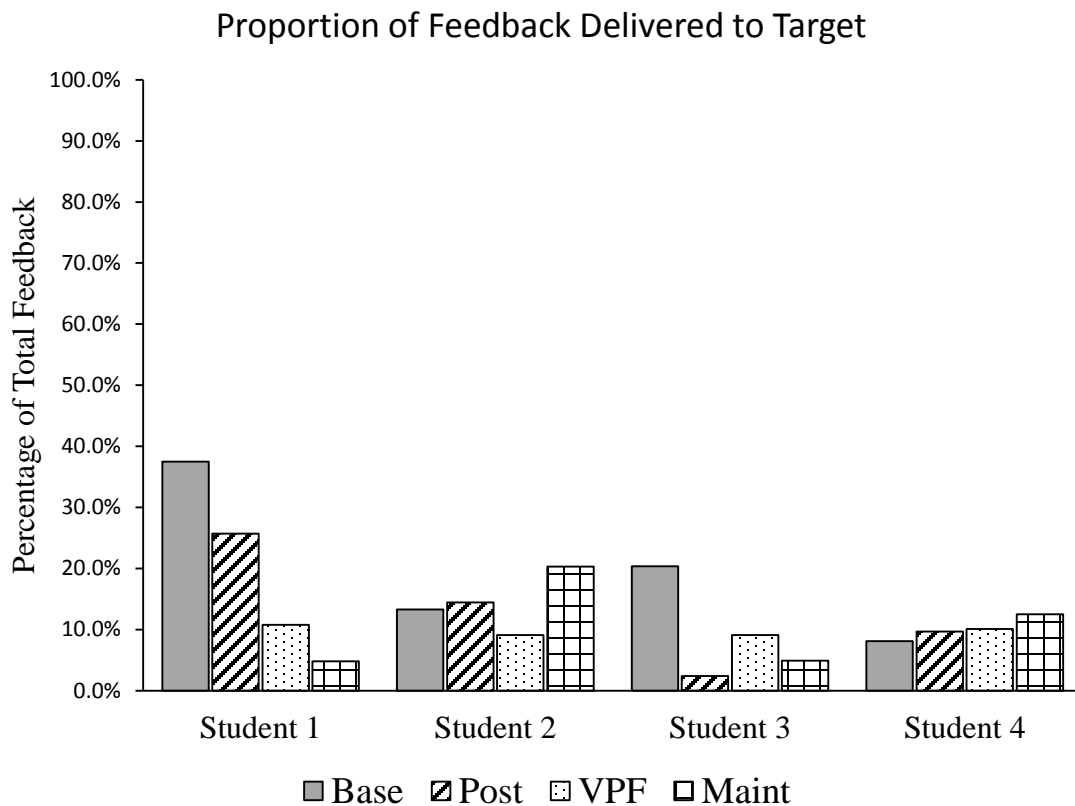
Figure 8. Mean proportion of total positive feedback target students received by condition.

Student 2

During baseline conditions, Student 2's overall engagement level was stable with a mean total engagement of 99.6% (range of 97.6% to 100%) of the time. During post-training, Student 2's overall engagement level was stable with a slightly lower mean total engagement level of 98.3% (range of 95.1% to 100%) of the time. During the VPF condition, total engagement level was stable with a slightly higher mean of 99.2% (range of 95.8% to 100%) of the time. When the intervention was withdrawn, Student 2's mean total engagement level decreased slightly to 99.1% (range of 97.2% to 100%). Student 2 did not engage in disruptive behavior throughout the course of the study.

During baseline, Teacher 2 delivered a mean of 13.3% (range of 0.0% to 36.4%) of her positive feedback to Student 2. Following training, Teacher 2 delivered a slightly lower proportion of positive feedback to Student 2 with a mean of 12.6% (range of 0.0% to 33.3%). During the VPF condition, Teacher 2 further reduced the proportion of positive feedback delivered to Student 2 with a mean of 9.1% (range of 0.0% to 13.0%). During the maintenance condition, Teacher 2 increased the proportion of positive feedback delivered to Student 2 with a mean of 20.3% (range of 0.0% to 35.3%).

Student 3

During baseline conditions, Student 3's overall engagement level was variable with a contratherapeutic trend prior to teacher training and a mean total engagement of 92.4% (range of 72.7% to 100%) of the time. During post-training, Student 3's overall engagement level was variable, increasing to a mean total engagement level of 94.4%

(range of 82.9% to 100%) of the time. During the VPF condition, the mean total engagement level decreased to 93.4% (range of 68.2% to 100%) of the time with continued variability. When the intervention was withdrawn, Student 3's mean total engagement level decreased slightly to 93.2% (range of 86.5% to 100%).

Student 3's mean frequency of disruptive behavior during baseline was variable with a mean of 0.63 (range of 0 to 5). Throughout the post-training condition, Student 3 did not engage in disruptive behavior. During the VPF condition, disruptive behavior was stable with a mean of 0.22 (range of 0 to 2). Following withdrawal of VPF, disruptive behavior decreased to zero occurrences throughout the maintenance condition.

During baseline, Teacher 3 delivered a mean of 20.4% (range of 0.0% to 100%) of her positive feedback to Student 3. Following training, Teacher 3 delivered a lower proportion of positive feedback to Student 3 with a mean of 2.4% (range of 0.0% to 16.7%). During the VPF condition, Teacher 3 increased the proportion of positive feedback she delivered to Student 3 with a mean of 8.2% (range of 0.0% to 36.4%). During the maintenance condition, Teacher 3 delivered a lower proportion of positive feedback to Student 3 with a mean of 4.9% (range of 0.0% to 12.5%).

Student 4

During baseline conditions, Student 4's overall engagement level was variable with a mean total engagement of 94.3% (range of 79.2% to 100%) of the time. During post-training, Student 4's overall engagement level was stable with an increased mean total engagement level of 98.2% (range of 93.7% to 100%) of the time. During the VPF condition, total engagement level was stable with a slightly higher mean of 98.4% (range of 89.0% to 100%) of the time. When the intervention was withdrawn, Student 4's mean

total engagement level increased to 99.7% (range of 99.2% to 100%). Student 4 did not

engage in disruptive behavior throughout the course of the study.

During baseline, Teacher 4 delivered a mean of 8.1% (range of 0.0% to 35.7%) of

her positive feedback to Student 4. Following training, Teacher 4 delivered a higher

proportion of positive feedback to Student 4 with a mean of 9.7% (range of 0.0% to

25.0%). During the VPF condition, Teacher 4 further increased the proportion of positive

feedback delivered to Student 4 with a mean of 10.1% (range of 0.0% to 20.0%). During

the maintenance condition, Teacher 4 increased the proportion of positive feedback

delivered to Student 4 with a mean of 12.5% (range of 7.7% to 17.4%).

Social Validity

As a measure of the social validity of the intervention (i.e., training and real-time

VPF), I asked each teacher to complete the adapted IRP-15 at the conclusion of the study.

The IRP-15 evaluates the general acceptability of a treatment with higher scores

indicating higher acceptability (Martens et al., 1985); total scores of 52.5 or greater

indicate an acceptable intervention (Von Brock & Elliott, 1987). I asked 10 additional

Likert questions (adapted from Hawkins & Heflin, 2011) as well as five open response

questions to further evaluate teachers' perceptions of the interventions. Table 9 includes

aggregated results for each survey item.

Table 9

Aggregated Social Validity Ratings by Survey Item

Survey Item	Mean	Range
1. RVPF would be an acceptable method to address the classroom management needs of teachers.	5	4-6

2. Most teachers would find RVPF appropriate for addressing classroom management needs including use of positive feedback.	4.8	4-6
3. RVPF should prove effective in changing teachers' rate of positive feedback delivery.	5	4-6
4. I would suggest the use of RVPF to the other teachers.	4.8	4-6
5. Increasing positive feedback delivery is important enough to warrant use of RVPF.	4.8	4-6
6. Most teachers would find RVPF suitable for meeting classroom management needs as described.	4.8	4-6
7. I would be willing to use RVPF again in the school/classroom setting.	5.3	5-6
8. RVPF would not result in negative side-effects for the teacher.	5	4-6
9. RVPF would be appropriate for a variety of teachers.	4.8	4-5
10. RVPF is consistent with other training methods I have used in school/classroom settings.	4	3-5
11. RVPF was a fair way to handle classroom management training of positive feedback delivery.	4.8	4-6
12. RVPF is reasonable for the classroom management training.	5	4-6
13. I like the procedures used in RVPF.	5	4-6
14. RVPF was a good way to handle the need for classroom management training.	4.8	4-6
15. Overall, RVPF would be beneficial for teachers.	5	4-6
* Changes in teacher practice (i.e., increased positive feedback delivery) positively impacted student behavior	4.7	4-5
* I believe positive feedback helps the students in my class.	5.3	4-6
* Positive feedback improves my interactions with students.	5.5	5-6
* I would tell other teachers about positive feedback to assist them with students in their classrooms.	5.5	5-6
* I will continue to use positive feedback in my class in the future.	5.8	5-6
* I liked participating in the research project.	5.5	5-6
* I liked working on my positive feedback delivery.	5.3	4-6
* I liked it that another adult was noticing me giving my students positive feedback.	5	4-6

* I enjoyed having observers in my classroom.	5.3	4-6
* I would have preferred to keep track of my own positive feedback rather than have an observer record my positive feedback.	2	1-3
* I would like my supervisor to give me positive feedback.	5.8	5-6

Overall, results from the adapted IRP-15 indicated a high level of acceptability with a mean total score of 71.5 (range of 65 to 85). The mean item level rating was 4.8 (range of 3 to 6), indicating that teachers generally agreed or slightly agreed with each item. Survey item 10 (i.e., "RVPF is consistent with other training methods I have used in school/classroom settings") had the lowest mean rating of 4.0 (Teachers 1 and 2 rated the item 5 and 4, respectively; Teacher 3 chose not to rate the item; and Teacher 4 rated it a 3). Additionally, teachers generally perceived that changes in their practice (i.e., increased positive feedback delivery) positively impacted student behavior ($M = 4.7$, range = 4-5) and that positive feedback: (a) helps their students ($M = 5.3$, range = 4-6), (b) improves their interactions with students ($M = 5.5$, range = 5-6), (c) is a practice they liked working on ($M = 5.3$, range = 4-6), (d) is a practice they would share about with other teachers ($M = 5.5$, range = 5-6), and is a practice they will continue using in the future ($M = 5.8$, range = 5-6). Further, teachers enjoyed participating in the research project ($M = 5.5$, range = 5-6), including having observers in the classroom ($M = 5.3$, range = 4-6) and having another adult notice them delivering positive feedback to students ($M = 5.0$, range = 4-6). Also of note, teachers generally disagreed with the concept of self-monitoring their positive feedback rather than having an observer record their feedback ($M = 2.0$, range = 1-3). Finally, teachers strongly agreed that they would like a supervisor to give them positive feedback ($M = 5.8$, range = 5-6) with Teacher 4

even adding four exclamation points next to her rating of 6 (i.e., "Strongly Agree") on this item.

In addition to the item ratings, teachers provided written responses to several open-ended questions. Teachers wrote positively about the experience of receiving real-time VPF on their positive feedback. Teacher 1 wrote that "it was helpful to have a visual cue." Teacher 2 wrote, "It helped me stay focused about providing positive feedback to my students. I enjoyed having others in my room taking data on my positive feedback." Teacher 3 wrote, "It made me more cognizant of my interactions with students, especially at a time of year when teachers are tired and misbehaviors tend to increase. I found myself making a better effort to be positive." Teacher 4 wrote, "Very informative. Made me realize I was not doing it as often as I could."

The teachers reported some challenges related to using the iPad. While Teacher 4 wrote that she loved carrying and using the iPad and Teacher 1 said it was fine, Teacher 3 wrote that it was sometimes "a bit awkward or inconvenient but just for a short time period," and Teacher 2 preferred the iPad to be "sitting on the desk where I could see it." Teacher 2 also wrote, "I felt a little stressed using the iPad because I know I was trying to reach a certain level, but I didn't want my positive feedback to not be real." Teacher 3 wrote, "It was a bit of a distraction at times when I was trying to focus on content and other distractions in the room. I lost my teaching focus a few times because I was trying to be aware of my feedback I was receiving." Further, Teacher 4 wrote that she "hated when [she] went under" her previous performance. Despite these challenges, teachers rated the intervention highly and indicated that real-time VPF was reasonable to use,

beneficial for both themselves and students, and something they would be willing to use

again in the future and to recommend to their colleagues.

CHAPTER 5

DISCUSSION

The purpose of this chapter is to provide an overview and discussion of the major

findings of this study, which examined the effects of real-time VPF on teachers' use of

positive feedback as well as collateral effects on negative feedback and student behavior.

The study built upon previous studies of performance feedback, including studies of

immediate performance feedback delivered using bug-in-ear technology. I incorporated a

number of elements to improve upon limitations of previous studies and to address

standards for high quality single-subject research, including (a) developing thorough

operational definitions of variables; (b) using frequent and sensitive measures of

reliability (i.e., point-by-point, interobserver agreement across variables, settings, and

conditions) and fidelity (i.e., checklists completed by independent observers for training

and VPF); (c) employing a concurrent, multiple baseline design with a minimum of five

data points per condition; (d) isolating VPF from training; (e) conducting direct

classroom observations; (f) including a maintenance condition; and (g) conducting both

visual and statistical analyses to determine functional relationships.

Summary of Findings

VPF has had beneficial effects on teacher practices in a variety of studies of coaching interventions (e.g., Hawkins & Heflin, 2011). Typically, VPF has been provided in post-observation meetings on a deferred schedule, despite the fact that evidence suggests feedback is most effective when delivered immediately (e.g., Scheeler et al., 2004). In this study, I explored whether real-time VPF provided using wireless technology would be effective for increasing a discrete teacher practice (i.e., positive feedback) for four general education teachers in a middle school. Additionally, I examined whether changes in teachers' use of positive feedback would have collateral effects on their use of negative feedback and on targeted students' engagement levels and disruptive behavior. This section includes an overview and discussion of major findings in relation to the following two research questions:

(1) To what extent is real-time VPF using wireless technology effective for increasing teachers' rates of positive feedback?

(2) Do changes in teachers' rates of positive feedback produce any collateral effects (i.e., changes in teachers' negative feedback, student engagement, or student disruption)?

Research Question 1. Findings from the current study suggest that training alone lacked a functional relationship with teacher practice, producing weak or no effects. Across teachers, small gains in mean frequencies of positive feedback occurred from baseline to post training conditions, effects which were generally not discernible through visual analysis due to little change in level and the presence of heavy overlap. This

finding was consistent with previous studies in that training alone has generally been insufficient to produce desirable change in teacher practice (e.g., Opfer & Pedder, 2011).

Unlike training alone, real-time VPF produced mixed, moderate effects; while an immediate level change occurred for several teachers, the strength of effects decayed throughout the VPF condition for some resulting in overlap between conditions. Teacher 3's data provided the strongest demonstration of the effect of real-time VPF on positive feedback with an immediate, clear, and complete level change and very stable responding throughout the intervention condition. Teacher 2's data also provided a strong demonstration of effect. While there was overlap between the post-training and VPF conditions and a moderate effect size estimate, prior to intervention Teacher 2's data had a steep, contratherapeutic trend. Upon introduction of VPF, there was an immediate, clearly visible change in level and trend (which was slightly therapeutic across the condition). Teacher 1's data provided a moderate demonstration of effect that lacked the clarity of Teacher 2's and Teacher 3's data due to overlap between conditions. Upon introducing VPF, Teacher 1's data had an immediate change in level but followed a curvilinear trend, with a reduction of positive feedback following the first three days of VPF and a therapeutic trend for the final four days of the condition. Teacher 4's data did not demonstrate any effect. While her mean frequency of positive feedback during the VPF condition was 1.5 times greater than during previous conditions, her behavior was highly variable throughout all conditions of the study, suggesting that it was under the control of other variables.

Taken together, the teachers' responses (i.e., immediate changes in level and trend) to real-time VPF provide three demonstrations of effect, which is sufficient to

101

establish experimental control (Gast, 2010) and suggests that real-time VPF may be an effective means for improving teacher practice. However, because the effects were mixed with decaying strength, including a somewhat modest effect for Teacher 1 and no effect for Teacher 4, these results should be interpreted with caution, and further research is certainly necessary to establish the effectiveness of the intervention.

Throughout the course of the study, I recorded field notes, and some of my anecdotal observations may help to explain the responding of Teacher 1 and Teacher 3. In the case of Teacher 1, following the first few days of VPF, she began to put the iPad down on a desk very soon after each observation began; on one occasion she set the iPad on the floor out of sight, and on another she immediately set it face down in a box against the wall. Her behavior suggested that seeing the iPad may have been aversive to her, and setting it down out of sight may have functioned as negative reinforcement. While her responses on the social validity survey indicated the intervention was acceptable, she did have the lowest IRP-15 score (i.e., 67) of the group. On the other hand, during several intervention sessions in the latter half of the condition, she carried the iPad with her throughout the observation rather than abandoning it, and those were invariably the days with her higher levels of positive feedback. I did not design a method for this study to control the frequency with which teachers looked at the iPad, so the lower frequency—in essence, a lower dose—at which Teacher 1 carried and looked at the iPad may explain her responding.

Additionally, Teacher 4 had highly variable frequencies of positive feedback, suggesting that her behavior was under the control of other variables. Teacher 4 had a multi-tiered classroom behavior management system in place, which may have

influenced her use of positive feedback. Further, she frequently varied her instructional format, which may have been a confounding variable. Her instruction was much more interactive on some days than others; one day might include a lecture with a few opportunities to respond for students while the next would be heavily centered on student engagement. For example, on many days, her instruction included having students create their own questions for one another to answer; during these lessons, Teacher 4 gave positive feedback both to the student who asked a question and the student or students who answered it, resulting in high frequencies of positive feedback. After one observation during which Teacher 4 delivered a lecture introducing an upcoming unit with little interaction with students, she pulled me aside and apologized, saying, "Sometimes you just have to go old school on them." These anecdotal observations suggest that instructional format may have been a confounding factor in the study.

Finally, changes in teacher practice did not maintain over time for all teachers. Teacher 2 and Teacher 3 maintained similar levels of positive feedback during the maintenance condition, while Teacher 1's behavior returned to baseline levels by the end of the study, including the use of more negative than positive feedback. Teacher 4's positive feedback continued to be variable during maintenance. Teacher 2 and Teacher 3 may have contacted natural reinforcers in the classroom that allowed them to maintain similar rates of responding, whereas the iPad may have served as a salient—if not also aversive—discriminative stimulus for Teacher 1 with its removal signaling the end of reinforcement for increased use of positive feedback.

Research Question 2. In addition to studying the effect of real-time VPF on teachers' positive feedback, I also collected data on several secondary variables,

including teachers' negative feedback, target student engagement levels, and target

student disruptions. While the study was not designed to make causal inferences

regarding these variables, I included them to add useful information to the interpretation

of results.

Teachers' use of negative feedback. I included frequency of negative feedback

as a variable to determine whether it would correspond with changes in frequency of

positive feedback. For example, when teachers are trained to use more positive feedback:

(a) they may use more feedback in general, resulting in increased negative feedback; (b)

their negative feedback may remain stable, independent from positive feedback; or (c)

negative feedback may decrease as teachers become more focused on identifying

positives in the classroom.

In this study, negative feedback generally remained stable at low frequencies

throughout the study and across participants with two main exceptions. Teacher 1's

negative feedback immediately decreased for two sessions following training and

generally remained at a lower level than baseline during the post-training and VPF

conditions. However, maintenance probes indicate that Teacher 1's negative feedback

frequency had a contratherapeutic trend at the end of the study. Addtionally, Teacher 3

increased her use of negative feedback following training, reaching levels as high as 20

negative feedback occurrences, with a contratherapeutic trend prior the VPF condition.

Upon introduction of VPF, her negative feedback immediately decreased in level with an

overall therapeutic trend across the condition. Overall, as teachers began to use higher

frequencies of positive feedback throughout this study, their use of negative feedback did

not increase and even improved in some cases.

Because teachers did not increase their frequencies of negative feedback as their positive feedback improved, all teachers demonstrated improved mean ratios of positive to negative feedback. Both Teacher 1 and Teacher 3 were using more negative than positive feedback during baseline, but during the VPF condition their ratios of positive to negative feedback improved to nearly 5:1 and 3:1, respectively, reaching levels often recommended by scholars (e.g., Gable, Hester, Rock, & Hughes, 2009). Teacher 2 and Teacher 4 exhibited much higher ratios, ultimately delivering positive feedback at nearly 16 and 21 times the frequency of negative feedback, respectively. This finding suggests that training with real-time VPF may be a useful way to improve the ratio of positive to negative feedback in addition to the frequency of positive feedback, producing a more positive classroom climate.

Student behavior. Despite improved ratios and increased positive feedback, there was no apparent relationship between the teachers' use of positive feedback and the target students' behavior. Student 2 and Student 4 had high total engagement levels that were fairly stable throughout the study. Student 4 made slight improvements throughout each condition of the study, primarily due to reductions in down-time. Down-time is dependent upon the teacher (i.e., down-time only occurs when a teacher has not provided any academic or behavioral expectations for students), so Student 4's improvement in total engagement level across conditions may simply represent the teacher providing more instruction and clear expectations.

Student 1 and Student 3 both had lower total engagement levels throughout the study and engaged in disruptive behavior. While Student 3's disruptive behavior decreased over the course of the study, his total engagement level remained stable. On

the other hand, while Student 1's disruptive behavior decreased over the study, his total engagement level worsened over time, primarily explained by increased time spent off-task as well as increased down-time from the teacher.

Two considerations may explain in part these patterns of responding across students: ceiling effects and feedback proportions. Student 2 and Student 4 both began the study with high engagement levels and very little room for improvement, introducing a ceiling effect. Perhaps if students had been targeted who had much lower levels of engagement, then changes may have been more apparent. Additionally the deterioration of Student 1's engagement and the lack of improvement of Student 3's engagement level may have been due in part to low and decreasing proportions of positive feedback. Specifically, as their teachers increased their overall frequency of positive feedback, they did not increase feedback delivered specifically to the target students. Considering target students did not actually receive more feedback over time, it is predictable that their engagement levels did not improve.

While student outcomes did not appear related to changes in teacher practice—possibly due to design limitations—this study began not with students but teachers in mind. The primary research question involved determining the effect of real-time VPF on teacher practice, so my focus was on identifying teachers with lower frequencies of positive feedback who were willing to participate. Therefore target student options were limited to students within class periods that participating teachers made available for the study; while screening procedures involved direct observations of multiple students in each classroom over time, most classes were made up of students with low rates of disruption and high rates of engagement.

Limitations and Future Research

This study included several limitations that may have influenced the internal and external validity of this study. First, as with all single-subject studies, the external validity of results is limited by the small sample size and lack of random sampling procedures (Gast, 2010). The external validity of single-subject designs is established through many systematic replications across participants and contexts. Additionally, single-subject research is but one step in a process of identifying evidence-based practices. While this study demonstrated a possible relationship between real-time VPF and positive feedback for three teachers, more studies are needed with more sophisticated methods and larger sample sizes to establish the generalizability and effectiveness of the intervention. For example, a large group study with random sampling and random assignment to control, training only, and training plus real-time VPF groups may be beneficial for isolating the effects of the intervention and producing results with greater external validity.

A second limitation relates to the treatment dosage. While various methods (e.g., fidelity checklists; teachers asked to carry iPads during instruction) were included to maintain consistent dosage, this study did not control how frequently teachers looked at and interpreted the VPF on the iPad. Teachers may have done so at different rates influencing the magnitude of effects, which appeared to have been a possible confound in the case of Teacher 1 who often abandoned the iPad. Future studies may control this aspect of dosage by prompting teachers to look at the VPF on a fixed- or variable-time schedule or each time the VPF is updated. Using a timed prompting device, such as a Motivaider, may introduce a confound, as the device itself may serve as an intervention

by prompting the teacher to deliver positive feedback rather than to just look at the iPad. Further, additional research is needed to determine an optimal, feasible dosage; in this study, teachers carried the iPad for 15 minutes daily, but other doses (e.g., 15 minutes every other day, 30 minutes once per week) may be as or more effective. A parametric analysis of real-time VPF would be a useful study.

Additionally, the current study isolated an antecedent intervention (i.e., VPF on the iPad) and did not include a specific reinforcement component (e.g., praise from the researcher for increasing use of positive feedback), even though evidence suggests that behavior is typically maintained by its consequences (see Cooper, Heron, & Howard, 2007). Many studies of performance feedback do not isolate performance feedback from other components (e.g., training, goal-setting, contingent reinforcers) of a treatment package, so I purposefully isolated real-time VPF from training and did not include any other components in order to isolate the effects of real-time VPF. The iPad may have served as a discriminative stimulus for teachers to emit positive feedback, and seeing the graph change (i.e., increase) during instruction may have had a reinforcing effect leading to an increased future probability of positive feedback behavior for some teachers. However, unless teachers' positive feedback was rule-governed (i.e., under instructional control after learning about the behavioral contingency that improved rates of positive feedback can lead to improved student outcomes; see Cooper et al., 2007), seeing improvement on the graph may not have had sufficient reinforcing value to maintain increased rates of positive feedback for some or all of the teachers. Future studies may benefit from including a planned reinforcer component to enhance the impact of VPF, such as providing positive feedback to teachers when they meet a pre-determined goal or

conducting a preference assessment to identify contingent reinforcers teachers can earn upon meeting goals.

This study examined whether immediate VPF had an effect on teacher behavior, but no comparisons were made to deferred feedback. Therefore, while conclusions were made about the effects of real-time VPF, this study cannot demonstrate whether those effects differ when compared to the effects of deferred feedback. Comparison studies of immediate and deferred VPF need to be conducted in the future to determine whether there are differential effects on teacher behavior due to timing. For example, researchers could conduct a group design study with participating teachers assigned to control, deferred VPF, and real-time VPF groups to compare effects on teacher practice.

Anecdotally, teacher behavior appeared to be at least partly controlled by instructional format; teachers in this study often taught whole group instruction using many different formats (e.g., lecture vs. interactive discussion vs. students creating their own opportunities to respond). While this is representative of the nature of an applied classroom setting, for the purposes of demonstrating experimental control, it may be better to situate a study in the context of a single instructional format (e.g., small group reading instruction using a standardized curriculum).

A practical concern may also represent a limitation in this study: while the intervention was only provided for 15 minutes each day, this form of daily VPF may be too intensive in many applied settings when a researcher is not available. Future research is needed to determine whether thinner schedules of performance feedback have similar effects. Additionally, studies are needed to compare the effects of real-time VPF provided by natural agents (e.g., colleagues, administrators, instructional coaches).

One of the more significant limitations of this study is that intervention effects were moderate and mixed with varying levels of overlap. It may be beneficial to start with a larger pool of potential parcipants and to identify teachers with low, stable rates of positive feedback or with flipped ratios of positive to negative feedback (i.e., teachers who deliver more negative than positive). Additionally, teachers' frequencies of positive feedback were variable, particularly in the case of Teacher 4, so it may be useful to identify a dependent variable that is more stable and occurs at low rates (e.g., behavior-specific positive feedback delivered to target students only).

Further, durability of effects was a concern in this study. In the case of Teacher 1, intervention effects were not consistent throughout the VPF condition and deteriorated once the intervention was withdrawn in the maintenance condition. While Teacher 2 maintained fairly high frequencies of positive feedback during the maintenance condition, her responding immediately decreased for three days when the intervention was withdrawn. This may have occurred because Teacher 2 received only half the number of intervention sessions that other teachers received, or it may have been simply because the intervention did not produce lasting change. These problems with durability of effects are not uncommon in studies of performance feedback with studies demonstrating intervention effects that have a contratherapeutic trend (e.g., Allday et al., 2012; Capizzi, Wehby, & Sandmel, 2010) or that immediately deteriorate once an intervention is withdrawn (e.g., Duhon et al., 2008). Practically speaking, an intervention designed to produce lasting change in teacher practice is not very useful if effects dissipate immediately upon the departure of the intervention agent. Considering this issue, more research is needed to identify performance feedback methods (e.g., thinning

110

strategies, additional components added to a treatment package) to ensure intervention effects are maintained.

Another limitation of this study was the high engagement levels and low frequencies of disruptive behavior of target students. Future studies could ameliorate the issue of student-level ceiling effects by specifically targeting classrooms that have students with low engagement or high disruption as well as teachers who deliver positive feedback at low rates. Additionally, future studies that seek to examine effects on students may need to deliver real-time VPF on teachers' positive feedback delivered specifically to target students rather than providing a bar graph of total positive feedback. This may improve the probability that teachers will deliver more positive feedback to the targeted students and allow finer analysis of the relationships between teacher practice and student behavior.

Moreover, future research should include comparison studies of different agents (researcher vs. natural agent), timings (real-time vs. different levels of deferred, such as after an observation, the next day, or the next week), and modes (in-person meetings, bug-in-ear, VPF) of feedback. Related to the first suggestion, all teachers in this study highly rated a desire to have positive feedback from a supervisor on the social validity survey, so a study of performance feedback delivered by a supervisor (e.g., a principal) would be beneficial. Additionally, direct comparisons of real-time VPF and bug-in-ear are warranted to determine whether they have differential effects and whether teachers find one mode preferable. A future study could use an alternating treatments design to rapidly switch the two interventions to determine whether differential responding occurs. Additionally, choice probes (i.e., days where teachers are able to choose whether to use

bug-in-ear or real-time VPF) could be embedded into the design as a more precise method of determining social validity; while one intervention mode may have greater effects, the other may be preferable to teachers, which is important information.

Further, future research should examine other applications of real-time VPF, such as co-teaching dyads providing each other performance feedback to improve their instruction or teachers using similar technology for self-monitoring (e.g., a laptop with a PowerPoint presentation that functions as a score board and a remote for teachers to control their own VPF). Additionally, researchers may examine remote applications of real-time VPF by providing it remotely using Internet-based video-conferencing software; this is an extension of immediate performance feedback research that has allowed researchers to provide the bug-in-ear interventions to teachers in distant locations (e.g., Rock et al., 2014; Scheeler et al., 2011).

Finally, a number of questions have arisen for me as I completed this study that warrant further research. First, what is the optimal rate of positive feedback in a classroom, and is there a ceiling after which increased positive feedback is counterproductive? From my exploration of the literature, this appears to be an unanswered question. While scholars have described low rates of positive feedback in classrooms for decades and suggested that we need to make improvements, we do not appear to have empirical evidence to suggest an optimal rate of positive feedback, nor do we appear to have an objective measure of what actually constitutes "low" or "high" rates of feedback. Second, what is the optimal ratio of positive to negative feedback? Published articles and books suggest that positive feedback should be delivered three to five times more frequently than negative feedback. However, this does not appear to be a

suggestion based upon empirical evidence but instead appears to rest upon professional expertise and logical analyses. And finally, what maintains teacher behavior? Operating from a premise that behavior is maintained by its consequences, we need research to explore what contingincies specifically are most important to teachers and find ways to incorporate these into our interventions to change teacher behavior, much like we would consider function before developing an intervention for a student with challenging behavior. I believe this question should be of utmost importance to the field as we cannot support the success of all students, including those with disabilities, without also supporting the success of their teachers.

Implications for Practice

This study was an initial investigation of the effects of real-time VPF on teacher practice conducted with a small number of participants. While I designed this study using a number of methods to enhance both internal and external validity, the findings should be approached with caution, particularly by practitioners; specifically, real-time VPF requires further study using more sophisticated research designs to establish an evidence base. Real-time VPF may indeed be an effective means of improving teacher practice, but this study in itself is insufficient evidence. Additionally, the evidence base for other modes of immediate performance feedback (e.g., bug-in-ear) is still being established. Further, we have only recently established quality indicators for identifying evidence-based practices in Special Education (see Cook et al., 2014), so many past studies may need to be replicated using more rigorous methods to establish an evidence base.

With those cautions in mind, practitioners may benefit from some of the information in this study. Specifically, they are likely to find training alone to be insufficient to produce lasting change in teacher practice, and, consequently, may find performance feedback in general to be a useful tool for improving teacher practice. Practitioners also may benefit from considering the consequences that maintain teacher behaviors to find ways to positively influence teacher practice. Finally, practitioners should be aware that positive feedback, though perhaps one of the most well-established teacher practices, often occurs at rates much lower than scholars consider optimal; therefore, many—and perhaps all—teachers may see academic and behavioral benefits in their classrooms from increasing their use of positive feedback.

Conclusion

In summary, this study examined the effect of real-time VPF on teacher's positive feedback, and resulted in mixed, moderate effects. While training alone was insufficient to produce notable change in teacher practice, the addition of real-time VPF generally led to teachers increasing their use of positive feedback while maintaining stable and low rates of negative feedback. Student behavior did not appear to have a direct relationship with changes in teacher practice. Overall, considering the mixed effects, this study suggests that real-time VPF could be an effective intervention for teacher behavior change but requires further study. Real-time VPF warrants further study, including additional replications before conducting studies that incorporate more sophisticated designs with larger samples. While a number of effective practices have been identified that positively affect student outcomes, many of them have yet to be consistently translated into practice in applied settings, perpetuating a concerning research-to-practice

114

gap. Therefore, continued studies of similar interventions that target lasting teacher

behavior change (e.g., performance feedback, coaching) are critical to the improvement

of practice.

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LIST OF APPENDICES

Appendix A: Coding Manual

Appendix B: Positive Feedback Training

Appendix C: Fidelity Checklists

Appendix D: Social Validity Questionnaire

Appendix A

CHRIS
DATA COLLECTOR CODING MANUAL
And TRAINING PROCEDURES

TRAINING and RELIABILITYPROCEDURE

Use the following strategy to train data collectors to become reliable.

- Go over CODE DEFINITIONS and CODING RULES daily. This will enforce the definitions and rules so there will not be a tendency to stray from the established system. Everyone is prone to observer drift and studying the definitions and rules daily help with accuracy.

- Start with short sessions of observations using BEST Training DVD. With each scenario, the target student will have a red box to indicate which student is the target. The screen will present a 5 second count-down to start. Have all students collect data at the same time.

- On first practice session, have data collectors watch the classroom scenario without attempting to collect data. As events occur, the trainer should call out the appropriate code. Stop the DVD if necessary to discuss why certain events would be coded in the way called out.

- After watching two scenarios and calling out the appropriate codes, have data collectors code the behaviors using a paper and pencil format. After each scenario, check the recorded data for reliability

- Continue to practice on the two familiar scenarios until the data collectors have achieved 80% reliability. Once they have achieved 80% reliability, have them code the two scenarios using the handheld PDA and MOOSES software. After each scenario, print out the recorded codes and talk through the data line by line. Compute reliability. Once data collectors have achieved 80% reliability, have them record data using the two scenarios they have not observed. Once they have achieved 80% reliability on the second set of scenarios, they are ready to begin training with live observations.

- Start with short sessions of live observations, approximately 10 minutes. If there is difficulty getting reliable, shorten the session to 5 minutes. In between each session, leave the observation area and talk through the data line by line immediately following that particular session.

- Try to do as many short sessions in the time allocated. In a 30-minute period, you should be able to get at least four 5-minute sessions in with a discussion in between. The more sessions scored will increase the chances of becoming reliable across all codes in a more reasonable time frame.

- Immediately after the coding session, run the inter-observer agreement. This will aid in seeing some weaknesses. During this period an error analysis needs to be done on each session that is not reliable so that the problem areas are even more magnified. Brainstorming on examples, going over tapes, and studying the code definitions, can emphasize concentration on these codes.

PROTOCOL FOR DATA COLLECTION

1. Each time you collect data, you will need a **handheld PDA computer and folder with post-it notes.** Always check your hand-held power supply.

2. Arrive early enough to the observation site to determine the most optimal place to sit. Position yourself in close proximity to the target student so you can hear what is said and you have a clear vision of student behavior and activity. If you are taking reliability with another coder, consider where to position both of you without affecting the flow of the classroom and regularly occurring activities. Try not to disturb the normal interactions of the environment. After the initial visit, you do not need talk to the staff upon entering the environment (unless you need specific information). It is okay to acknowledge staff; however, you should not engage him/her in a conversation or disturb the site flow. The same holds true for the target student and peers as well. You can expect peers to be

curious about your presence, but DO NOT talk to them at length. If a peer tries to engage you, politely tell him/her that you cannot talk right then, that you have work to do.

3. Enter/exit the area as inconspicuously as possible. Avoid taking extra items (not required for data collection) with you, and make sure that you have all the necessary materials prior to entering the room. Never respond to student behavior (e.g. laughing). Similarly, you should not respond when negative things. We are strictly observing events as they happen, and do not want our actions in any way to resemble judgment or criticism. If you are disturbed by what you have observed, you may discuss it with us, but no one else.

4. After you are situated in the environment, turn on your handheld and begin collecting data.

A few miscellaneous things…

Always be on time—Remember that we are guests and are there at the convenience of staff. If you are going to be late, you should call the site to let the staff know. Phone the project coordinator at the earliest possible time (i.e. the night before) if you are unable to come to work due to illness or an emergency so we can try to find a replacement for your scheduled sessions.

<u>Confidentiality</u>- Remember that we have **GUARANTEED** confidentiality to all participants in the study. You should never discuss anything with anyone other than project staff. It is never appropriate to identify participants in the study to others, or to discuss what you have observed during the course of the study. It is also imperative that we remain prompt, courteous, and cooperative with the staff of the study.

STEPS FOR USING MINI-MOOSES

1. Turn on hand-held using power button on upper right hand side.
2. Using the stylus choose **Start** and then **MiniMoose3**
3. Choose **File** (bottom left hand corner of screen) and **New File**
4. Using the document <u>CHRISCodes</u> follow the steps to name the file
5. On the same screen choose **Folder** and "*Your Name* Data File" (ex. Parish Data File) and then **Save**
6. Under the **Header** line write "one" or "mul" depending on the number of teachers in your room then hit **OK** UNLESS you are coding a reliability observation. If so, in the Header line the primary observer opens the keyboard (middle of the screen) adds one space and puts "pri". If the observer is not the primary observer code, "rel".
7. Before the coding session begins, choose Passive Engagement as the default.
8. From the lower part of the screen choose **Timer**. When coding with a partner count down, "3-2-1-**Start**"
9. When the observation is up at 15 minutes, in the middle of the screen a box appears that states that the session is over. In the upper right corner of that box click on "OK".
10. On the bottom left of the screen choose **File** and then **Exit**.
11. Your observation file is now saved.

DIRECTIONS FOR SENDING DATA FILES

1. Using the USB cord, attach the hand-held to your computer.
2. When the *Windows Mobile Devise Center* Screen appears, choose:
   Connect without setting up your device
3. From the options given choose:
   File Management and then
   Browse the contents of your device
4. After locating the data files to be sent, drag them onto your desktop. Exit out of the Windows Mobile Devise and disconnect hand-held.
5. Open and compose an e-mail, attaching the necessary data files.
6. When sending observations, in the subject line write: School Name **Data Files**. Example: Milton Data Files. If sending a reliability file, in the subject line write: School Name **Reliability—MP & NS**
7. Do not attach both reliability files and data files in the same email to Regina. First send your data files and then in a separate email send your reliabilities.
8. If possible send all observations to Regina Hirn the same day they were completed.
9. If you had to use the FIX key during an observation clean up the file before sending it. Fixing a file:
   a. On the handheld open Office Mobile
   b. Choose Word Mobile
   c. Select file that needs to be fixed
   d. Find the word FIX and delete the code before the word as well as the word FIX
   e. Choose OK

Direct Observation Codes
INSTRUCTION VARIABLES

	Code	Descriptor	Definition
Teacher Behavior **Frequency**			
	Code	Descriptor	Definition
Frequency Counts	TP	Target Pos *GO Command*	Positive Feedback that **includes** the **target** student. Teacher gives the whole class, a group of students including the target, or the individual target student feedback on an academic or social behavior that indicates the behavior/response is correct. Manners exhibited (thank you) *Examples:* *"Students who are copying down the objective and outline are showing they know how to get the task started, I respect their independence."* *"Thanks for submitting the assignment; I'm pleased to see it."* *"Everyone was in their seat and working on the warm-up problem when the bell rang, I appreciate your responsible self-management."* *"Thanks for raising your hand first."* *Great job!* *Non-examples:* *"Yes, you're right"* to another student (Code as Nontarget Positive)
	TN	Target Neg *STOP Command*	Negative Feedback that **includes** the **target** student. Teacher informs target student (or a group including the target) that behavior/response is incorrect (e.g., "no" "stop that" "turn around" "quiet") *Examples:* *A teacher puts finger to lips and says, "SHH!"* *"Sam, quit wasting time and get back to work."* *"You need to pay attention or you won't know what to do."* *"Stop bothering Kim."* *"I told you to sit down."* *Teacher raises her finger to her mouth to gesture students to be quiet.* *Teacher asks Jan to "have a seat" when Jane gets of her seat during independent seatwork.* *Teacher takes pencil/iPod/cell phone away from student who is playing with it and not following instructions.* *Non-examples:* *"Try harder on your math worksheet; I know you can do better."* *Students come in to class after fire drill and teacher asks them to "take a seat".* *"I want everyone's attention while I go over this example."*

	NP	NonTarg Pos *GO Command*	Positive Feedback given to a student or group of students, **excluding** the target student. Any positive feedback the teacher delivers to a student or group of students that does **not** include the target student. Teacher gives a nontarget, individual student (or group of nontarget students) feedback on an academic or social behavior that indicates the behavior/response is correct. Manners exhibited (thank you) *Examples:* • *(Target student is in Group A) "Everybody in Group B is doing great work."*
	NN	NonTarg Neg *STOP Command*	Negative Feedback given to a student or group of students, **excluding** the target student. Teacher informs nontarget, individual student (or group of nontarget students) that behavior/response is incorrect, (e.g., "no" "stop that" "turn around" "quiet") *Example:* • *(Target student is Susan) "Devon, stop shouting!"*

STUDENT OBSERVATION VARIABLES

		Student Behavior **Duration**	
	Code	Descriptor	Definition
Mutually Exclusive At least One Variable Must be Toggled On	AE	S Act Eng	Student Active Engagement: Student is actively engaging with instructional content via choral response, raising hand, responding to teacher instruction, writing, reading, or otherwise completing assigned task. *Examples:* • *Target student is writing on an assigned worksheet page.* • *Target student is reading out loud with the class when directed to do so, following along with finger or eyes in text.* • *Target student is working on the computer assigned task from the teacher.* • *Target student is working in assigned group helping to complete a task.* . *Non-examples:* • *Student is watching or listening* • *Target student is oriented towards the teacher or speaker and appears to be following instruction or course of events.* • *Student is sleeping*
	OF	S Pass Eng *SET AS DEFAULT	Student Passive Engagement: Student is passively attending to instruction by orientation to teacher or peer if appropriate. Examples: • Student is listening to lecture or watching presentation including ppt or video • Student looks and listens to another student called on. • Head down on desk yet eyes oriented to teacher

			• Target student is oriented towards the teacher or speaker and appears to be following instruction or course of events. Non-examples: • Student has head down yet not looking at teacher • Student is reading silently (code as Act Eng) • Student looks and listens to a student talking off-task topic
	OT	S Off task	Student is neither actively engaged nor looking at the teacher but is not disrupting the class in any way (no negative behaviors). Examples: • *Target student is out of seat without permission but not bothering anyone else.* • *Target student looking away from the teacher or instructional materials.* • *Target student not complying with a request (e.g., to open books, to look at board, to write an answer and does not appear to be thinking about the answer to write)* • *Target student has head down on desk with eyes closed.* • *Target student is texting a friend.* • *Target student is playing with iPod.* *Non-examples:* • *Student looks away and talks to peer for less than 5 seconds.* *Student silently watches video*
	DT	Down-time	There are no academic expectations of the target student or group target student is part of. Use down-time any time a reprimand or discussion with another student exceeds 5 sec without clear expectations. If student leaves class to go to the restroom/get a jacket/get her jacket, code Downtime. Examples: • At beginning or end of class no instruction has started and class is talking amongst themselves • Target student finishes an assignment or test and lays their head down as nothing else has been asked of him/her. • Teacher is instructing and steps away to answer phone or speak to someone at door **without** informing students of what to do ("work on… while I attend to this") • Student leaves room with permission from teacher (use restroom/get a drink of water) Non-examples: • Teacher is lecturing and student is sleeping or has head down (Off Task) • Teacher is instructing and steps away to answer phone yet tells class to "go ahead and get a start on the project and I'll be right back" • All class is waiting and talking prior to instruction yet target student gets homework out and completes

			• Teacher reprimands another student for more than 5 sec yet tells class to "keep working while I talk to Tim"

Student Behavior Frequency		
DR	Disrupt	Student displays behavior that does or potentially could disrupt the lesson (e.g., out of seat; noises, talking to peer, making comments). Behaviors can range from low intensity (out of seat to sharpen pencil) to high intensity (making derogatory statements or destroying property). WHEN TO COUNT A NEW ONE: Code new event if topography changes (ie talking and then tapping) or if talking changes to new person or if 5 sec of pause or if other speaker (teacher or peer) respond then target talks again.

The DR row continues:

Examples:
Cell phone talking or any use with music/noise
Argumentative or Noncompliant Talk
Negative Talk
- *Target student is out of seat without permission and taking to peer.*
- *Target student is ripping or crumbling paper in loud way drawing attention from teacher and/or peers.*
- *Target student is making noise drawing attention from teacher and/or peers.*
- *Target student curses teacher or peers.*
- *Target student makes threatening comments to teacher or peers.*
- *Target student verbally refuses to complete assignment or comply with directions.*

Loudly tapping pen or rocking in chair to extent it is drawing attention or has potential to draw attention and disrupt instruction

Non-examples
Just cell phone use for texting (code as off task)
Sleeping
Laying head down
Not answering when called on
Quietly tapping pen or rocking in chair if not distracting or drawing attention

Some Guidelines
This class usually begins with a warm-up problem; coding can begin once the teacher begins discussing the warm-up with the class or begins instruction.
If the Teacher is absent: don't code that day, and notify us she was gone.
If the Target Student *only* is absent: continue with coding, and notify us the student was missing.

If an unexpected event occurs (e.g., fire drill), if possible begin coding a few minutes after class returns and instruction begins. Notify us that this event happened that day.
If there is a behavioral incident where the teacher has to clear the room, ending instruction, stop coding and leave for the day. Notify us about what happened.
If anything out of the ordinary for this classroom occurs, please notify us. Examples may include: other adults in the room; a new student; different type of lesson; other students engaged in unusual behavior; etc.
During Treatment
Treatment Fidelity Checklist – *when the treatment is in place, prior to beginning to code, a coder will complete the following checklist to ensure I am implementing all steps of the treatment daily*: ☐   Computer on with Excel form loaded ☐   iPad on ☐   Air Display application is synced (laptop display extends onto iPad) ☐   iPad shows bar graph with previous three days' data and today's session ☐   teacher given iPad
Count-down – *when treatment is in place, prior to beginning to code, a coder will initiate a 3-2-1 countdown so I can ensure the treatment timing matches the handheld*

Appendix B

Pre-Training: Positive Feedback

- **Definition of Positive Feedback**
  - Positive feedback involves positive verbal comments or gestures intended to promote desirable student behavior; positive feedback occurs *after* a student already has engaged in the behavior, potentially reinforcing that behavior and making it more likely to occur again in the future
  - Academic **AND** Social Behavior
  - Key Question: What do you want to see more of?
- **Behavioral Principles**
  - According to behavioral theory, all behavior serves one of two functions: to gain something or to avoid something. For example, a student whispers to a peer to gain her attention, or a student throws his book on the ground to avoid working on a difficult assignment. If the behavior is successful, then the student is more likely to do it again in the future, because the behavior has been reinforced. Reinforcement occurs when some consequence to a behavior makes that behavior more likely to occur again in the future. Positive feedback is a form of social attention that operates on the behavioral principal of reinforcement. Most students desire positive social attention from their teachers; positive feedback, then, is one way of promoting more appropriate behavior in the classroom. But students may also engage in inappropriate classroom behavior to gain a teacher's attention; even though the attention may be negative in the form of reprimands or other consequences, such attention may in fact inadvertently reinforce inappropriate behavior. By using positive feedback in response to desirable behavior, however, teachers can provide the social attention students desire while encouraging behaviors they want to see in class.
  - Reinforcement through social attention (paired with many reinforcers
  - Pairing yourself & classroom as an S^D (signal) that reinforcement is available for appropriate behavior
  - Much behavior (problem and non-problem alike) functions to get attention

- You give attention for desirable behavior ("You get what you pay the most attention to")

- **Benefits of Positive Feedback**
    - One of our most evidence-based practices
    - Increased compliance, engagement, skill acquisition, achievement, on-task behavior, engagement in instruction, following directions, correct academic responding, work accuracy, and work completion
    - Decreased disruption, off-task behavior, rule violations, and other problem behavior

- **Characteristics of Effective Feedback**
    - **Contingent** - conditional upon a student's performance of desired behavior. Students make a clear association between appropriate behavior and positive teacher attention, increasing the probability that they will behave more appropriately in the future
    - **Specific** - teacher explicitly identifies the appropriate behavior the student has performed and may also provide feedback about the student's performance
    - **Immediate** (within 3 seconds) - may be most important when a student is learning a new skill, is working on a difficult assignment, or has a history of behavior problems. When delayed, students may not make the connection between the positive attention and their behavior, or they may even resort to inappropriate behaviors to get immediate attention.
    - **Authentic** - Teacher use of positive feedback should be genuine and honest, delivered with a sincere tone and content that fits teachers' personalities. Furthermore, positive feedback should be customized to the needs and culture of each student
    - **Frequent** (need higher rates…low rates in KY for the average student)
        - 3:1 – 5:1 Ratio to Negative Feedback (need to be much more positive)
        - Seen at 0 rates in 50% of KY middle school observations
        - Average middle school student in KY receives only 1occurence of positive feedback every 25 minutes

- Average middle school student in KY receives 0.6:1 ratio
  - Targets the behavior you want to see; distributed among all students; targets both academic and social behavior
  - More OTRs, directions, expectations = more opportunities for positive feedback
  - Make sure when student answers an OTR or responds to a direction or follows a taught expectation, give positive feedback
  - Tries to "catch them being good" including challenging students
- **Examples**
  - "I like how you opened your book when I asked, Gina;"
  - "Tim, good job raising your hand before talking;"
  - "I like how everybody is quietly working on the assignment right now"
  - "Students who are copying down the objective and outline are showing they know how to get the task started, I respect their independence."
  - "Thanks for submitting the assignment; I'm pleased to see it."
  - "Everyone was in their seat and working on the warm-up problem when the bell rang, I appreciate your responsible self-management."
  - "Thanks for raising your hand first."
  - "Great job!"
  - "That's correct; one-fourth of eight is two."
  - "Yes, that's how you do this type of problem."
  - "Correct!"
- **Questions?**

Appendix C

Positive Feedback Training Fidelity Checklist	
DATE:	TEACHER #:

- ☐ Definition of positive feedback
- ☐ Behavioral Principles on which positive feedback operates
- ☐ Benefits of positive feedback
- ☐ Characteristics of effective feedback
  ☐Contingent ☐Specific ☐Immediate ☐Authentic ☐Frequent
- ☐ Five examples of positive feedback
- ☐ Offer to answer questions

VPF Training Fidelity Checklist	
DATE:	TEACHER #:

- ☐ Benefits of performance feedback
- ☐ Displays bar graph of teacher's baseline positive feedback
- ☐ Demonstrating use/interpretation of VPF on the iPad
- ☐ Ask teacher to use iPad daily until notified
- ☐ Offer to answer questions

Treatment Fidelity Checklist	
DATE:	TEACHER #:

- ☐ Computer on with Excel form loaded
- ☐ iPad on
- ☐ Air Display application is synced (laptop display extends onto iPad)
- ☐ iPad shows bar graph with previous three days' data and today's session
- ☐ Teacher given iPad

Appendix D

Intervention Rating Profile (IRP-15)
Adapted Version: Individualized Coaching Intervention

The purpose of this questionnaire is to obtain information that will aide in the selection of coaching interventions for teachers. The individualized professional development to increase teachers' presentation of a key classroom management skill (i.e., positive feedback) included individualized, real-time visual performance feedback (RVPF). Please circle the number which best describes your agreement with each statement.

Strongly Disagree 1	Disagree 2	Slightly Disagree 3	Slightly Agree 4	Agree 5	Strongly Agree 6

1. RVPF would be an acceptable method to address the classroom management needs of teachers.	1	2	3	4	5	6
2. Most teachers would find RVPF appropriate for addressing classroom management needs including use of positive feedback.	1	2	3	4	5	6
3. RVPF should prove effective in changing teachers' rate of positive feedback delivery.	1	2	3	4	5	6
4. I would suggest the use of RVPF to the other teachers.	1	2	3	4	5	6
5. Increasing positive feedback delivery is important enough to warrant use of RVPF.	1	2	3	4	5	6
6. Most teachers would find RVPF suitable for meeting classroom management needs as described.	1	2	3	4	5	6
7. I would be willing to use RVPF again in the school/classroom setting.	1	2	3	4	5	6
8. RVPF would not result in negative side-effects for the teacher.	1	2	3	4	5	6
9. RVPF would be appropriate for a variety of teachers.	1	2	3	4	5	6
10. RVPF is consistent with other training methods I have used in school/classroom settings.	1	2	3	4	5	6
11. RVPF was a fair way to handle classroom management training of positive feedback delivery.	1	2	3	4	5	6
12. RVPF is reasonable for the classroom management training.	1	2	3	4	5	6
13. I like the procedures used in RVPF.	1	2	3	4	5	6
14. RVPF was a good way to handle the need for classroom management training.	1	2	3	4	5	6
15. Overall, RVPF would be beneficial for teachers.	1	2	3	4	5	6
* Changes in teacher behavior (i.e., increased positive feedback delivery) positively impacted student behavior	1	2	3	4	5	6

Adapted from Martens, B. K., Witt, J. C., Elliott, S. N., & Darveaux, D. X. (1985). Teacher judgments concerning the acceptability of school-based interventions. *Professional Psychology: Research and Practice*, *16*, 191-198.

* I believe positive feedback helps the students in my class.	1	2	3	4	5	6
* Positive feedback improves my interactions with students.	1	2	3	4	5	6
* I would tell other teachers about positive feedback to assist them with students in their classrooms.	1	2	3	4	5	6
* I will continue to use positive feedback in my class in the future.	1	2	3	4	5	6
* I liked participating in the research project.	1	2	3	4	5	6
* I liked working on my positive feedback delivery.	1	2	3	4	5	6
* I liked it that another adult was noticing me giving my students positive feedback.	1	2	3	4	5	6
* I enjoyed having observers in my classroom.	1	2	3	4	5	6
* I would have preferred to keep track of my own positive feedback rather than have an observer record my positive feedback.	1	2	3	4	5	6
* I would like my supervisor to give me positive feedback.	1	2	3	4	5	6

Adapted from Hawkins & Heflin, 2011

(a) How would you describe the experience of receiving immediate, visual performance feedback?

(b) How did you feel about carrying and using the iPad?

(c) Were there any challenges, difficulties, or stressors related to using the iPad?

(d) How would you improve RVPF method?

(e) Other comments:

156

CURRICULUM VITA
CHRISTOPHER ANDREW SWEIGART

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EDUCATION

2011	Master of Arts	Special Education, Learning and Behavior Disorders, P – 12 University of Louisville Louisville, KY
2007	Bachelor of Arts	Biblical Studies Trinity Lutheran College Issaquah, WA

PROFESSIONAL EXPERIENCE

2015 – *present*	Instructor, Department of Special Education, Asbury University, Wilmore, KY. Courses: EDA 320 Exceptional Learner; EDA 428 Interventions for Differentiated Learning
2012 – *present*	Doctoral Candidate in Curriculum and Instruction, Learning and Behavior Disorders, Department of Special Education, College of Education and Human Development, OSEP Leadership Grant, University of Louisville, Louisville, KY.
2010 – 2012	Teacher of students with emotional and behavioral disorders, Shelby County Public Schools, Shelbyville, KY.
2008 – 2010	Program Coordinator, Transitional Housing and Mentoring Programs, Bellewood Presbyterian Homes for Children, Louisville, KY.
2005 – 2008	Director of Student Outreach, Jeremiah Community Youth Center, Edmonds, WA.

Research Experience

2014 - 2015   Lead, Quality Indicators Review Project, Louisville, KY.

2013 - 2015   Lead, Concurrent Visual Performance Feedback Technology Project, Louisville, KY.

2013 – 2015   Team Member, Teacher Coaching and Student Outcomes Project, Louisville, KY.

2013   Team Member, Bullying Research and School-wide Interventions Project, Louisville, KY.   2012 – 2013   Team Member, Mathematics Questioning Press Project, Louisville, KY

2012 – *present*   Data Analyst, Academic and Behavioral Response to Intervention (Project ABRI), Louisville, KY.

HONORS AND AWARDS

APBS Student Poster Award, 2014, 11th International Conference on Positive Behavior Support, Chicago, IL.

Comprehensive Exams Passed with Honors, 2014, University of Louisville, Louisville, KY.

MSLBD Doctoral Training Stipend Award, 2014, Midwest Symposium for Leadership in Behavior Disorders, Kansas City, MO.

Professional Development Program Award, 2013, Council for Children with Behavioral Disorders Foundation, Chicago, Illinois.

Office of Special Education Programs Leadership Grant, 2012-2014, University of Louisville, Louisville, KY.

Biblical Languages Award, 2007, Trinity Lutheran College, Issaquah, WA.

PUBLICATIONS

Sweigart, C.A., & Landrum, T.J. (*under review*). Could real-time visual performance feedback promote improved teacher practice? Considerations and a preliminary investigation.

Sweigart, C.A., & Scott, T.M. (*under review*). The dearth of evidence in support of praise for students with ebd in inclusive settings: A literature review.

Sweigart, C.A., & Evanovich, L.L. (*in press*). Transition assessment for students with learning and behavioral disabilities: Best practices and future directions. In B.G. Cook, M. Tankersley, & T.J. Landrum (Eds.), *Advances in learning and behavioral disabilities,* (Vol. 28). Bingley, UK: Emerald.

Landrum, T.J., & Sweigart, C.A. (2015). Simple, evidence-based interventions for classic problems of emotional and behavioral disorders. *Beyond Behavior, 23*(3), 3-9.

Sweigart, C.A. , & Landrum, T. (2015). Praise and encouragement. In W. George Scarlett (Ed.), *The SAGE Encyclopedia of Classroom Management*. Thousand Oaks, CA: SAGE.

Sweigart, C.A., & Landrum, T.J. (2015). The impact of number of adults on instruction: Implications for co-teaching. *Preventing School Failure*, 59, 22-29.

Harbour, K.E., Evanovich, L.L., Sweigart, C.A., & Hughes, L.E. (2015). A brief review of effective teaching practices that maximize student engagement. *Preventing School Failure, 59*, 5-13.

MANUSCRIPTS IN PREPARATION

Sweigart, C.A., Burt, J., Evanovich, L.L., Reed, L., & Cook, S.E.C. (*in preparation*). The effects of real-time visual performance feedback on teacher delivery of behavior-specific praise. *Manuscript in preparation*.

Sweigart, C.A. (*in preparation*). The effects of real-time visual performance feedback on teacher feedback. *Manuscript in preparation*.

Sweigart, C.A., Reed, L., & Evanovich, L.L. (*in preparation*). Examining quality indicators of the evidence base for performance feedback to improve teacher praise: A systematic review. *Manuscript in preparation*.

Reed, L., Sweigart, C.A., & Evanovich, L.L. (*in preparation*). Examining quality indicators of the evidence base for performance feedback to improve teachers' treatment integrity: A systematic review. *Manuscript in preparation*.

PROFESSIONAL PRESENTATIONS

Refereed National Conference Presentations

Sweigart, C.A., Reed, L.C., & Evanovich, L.L. (*under review*). The Use of Performance Feedback to Increase Teacher Praise: An Evidence-Based Practice? *Council for Children Behavioral Disorders International Conference,* Atlanta, GA.

Sweigart, C.A., & Evanovich, L.L. (*under review*). Transition assessment for students with learning and behavior disorders: Best practices and future directions. *Council for Children Behavioral Disorders International Conference,* Atlanta, GA.

Landrum, T.J., & **Sweigart, C.A.** (February, 2015). Behavioral foundations for academic and social success: practical strategies for teachers**.** *Midwest Symposium for Leadership in Behavior Disorders*, Kansas City, MO.

Evanovich, L.L., & **Sweigart, C.A.** (November, 2014). Live support: Facilitating effective practice in the classroom with coaching and performance feedback. *37th Annual TED Conference*, Indianapolis, IN.

Sweigart, C.A., & Evanovich, L.L. (October, 2014). Promoting effective teacher practice through live support in the classroom. *38th Annual Conference of Teacher Educators for Children with Behavior Disorders*, Tempe, AZ.

Evanovich, L.L., Hughes, L.E., & **Sweigart, C.A.** (March, 2014). Effectiveness of prompting evidence-based instructional practice (Poster). *11th International Conference on Positive Behavior Support*, Chicago, IL.

Landrum, T.J., & **Sweigart, C.A.** (February, 2014). Evidence-based interventions for behavioral and academic success**.** *Midwest Symposium for Leadership in Behavior Disorders*, Kansas City, MO.

Landrum, T.J., & **Sweigart, C.A.** (October, 2013). Extreme school violence and EBD: (How) do they intersect? *37th Annual Conference of Teacher Educators for Children with Behavior Disorders*, Tempe, AZ.

Sweigart, C.A., & Hughes, L. (October, 2013). Bullying: The current state of research. *37th Annual Conference of Teacher Educators for Children with Behavior Disorders*, Tempe, AZ.

Sweigart, C.A., Hughes, L., Evanovich, L., & Barnes, N. (October, 2013).Prompting increased rates of effective instructional practice: Teacher and student outcomes. *37th Annual Conference of Teacher Educators for Children with Behavior Disorders*, Tempe, AZ.

Sweigart, C.A., & Landrum, T.J. (September, 2013). Behavioral principles underlying instruction and intervention. *Council for Children Behavioral Disorders International Conference,* Chicago, IL.

Landrum, T.J., & **Sweigart, C.A.** (September, 2013). Simple, evidence-based practices for classic behavior problems. *Council for Children Behavioral Disorders International Conference*, Chicago, IL.

Sweigart, C.A., & Landrum, T.J. (February, 2013). Simple behavioral applications for academic and behavioral success: Strategies for individual students. *Midwest Symposium for Leadership in Behavior Disorders*, Kansas City, MO.

Sweigart, C.A., & Landrum, T.J. (February, 2013). Simple behavioral applications for academic and behavioral success: Classwide and group strategies. *Midwest Symposium for Leadership in Behavior Disorders*, Kansas City, MO.

Refereed Regional and State Conference Presentations

Sweigart, C.A. (*session to be presented* June, 2015). Behavioral foundations for student success: Effective use of positive feedback. *Kentucky CCBD Behavior Institute*, Louisville, KY.

Harbour, K.E., **Sweigart, C.A.**, & Hughes, L. (November, 2013). The whole truth: Building conceptual knowledge of whole number operations. *National Council of Teachers of Math 2013 Regional Conference*, Louisville, KY.

Other Presentations

Doctoral student and mentor panel discussion. (August, 2013). *University of Louisville Curriculum and Instruction Doctoral Student Orientation*, Louisville, KY.

Sweigart, C.A. (June, 2013). Antecedent instructional strategies to prevent challenging behavior in the classroom. *University of Louisville Special Education Conference*, Louisville, KY.

Sweigart, C.A. (April, 2012). Setting the temperature: Effective response to student behavior. *Shelby County East Middle Professional Development*, Shelbyville, KY.

COLLEGE TEACHING EXPERIENCE

Asbury University
Instructor, Exceptional Learner, EDA 320 (Spring 2015, Fall 2015)

Instructor, Interventions for Differentiated Learning, EDA 428 (Spring 2015, Fall 2015)

University of Louisville
Supervisor, Supervision of Student Teachers, University of Louisville (Spring 2014)

Guest Lecturer, Behavioral Principles and Interventions, Special Populations in Schools, EDSP 345 (Spring 2014)

Teaching Assistant, Characteristics, Needs, and Responses to Students with EBD, EDSP 675 (Spring 2014)

Teaching Assistant, Classroom Behavior Management, EDSP 260 (Fall 2013)

Co-Instructor, Special Populations in Schools, EDSP 345 (Fall 2013)

SERVICE

National Service
Guest Reviewer, Behavioral Disorders (2015)

Guest Reviewer, Education and Treatment of Children (2014)

Student Network Representative, Association for Positive Behavior Support Membership Committee (2013-2015)

Student Workgroup Member, Association for Positive Behavior Support Membership Committee (2013-2015)

Student Member, Association for Positive Behavior Support Membership Committee (2013-2015)

Reviewer, Topic: Implications of Education Reform Initiatives for Students with Disabilities, Council for Exceptional Children Annual Convention 2014 (June 2013)

Guest Reviewer, Education and Treatment of Children (2013)

Student Advocate to KY Representatives, Higher Education Consortium for Special Education (January 2013)

Service to Schools

Shelby County (KY) Public Schools (2012-2015)
- East Middle – Teacher training, behavioral consultation, special education mathematics PLC development, and administrator training on positive behavioral interventions and supports
- Wright Elementary – Behavioral consultation
- Painted Stone Elementary– Behavioral consultation
- Southside Elementary– Behavioral consultation
- Clear Creek Elementary – Teacher training and behavioral consultation
- Central Office –consultation and electronic database development for progress monitoring and decision-making for students with EBD in middle/secondary settings

Jefferson County (KY) Public Schools (2013)
- Myers Middle – Behavioral Consultation

Member, Positive Approach to Student Support District Leadership Team, Shelby County (KY) Public Schools (2011-2012)

Member, Positive Behavior Support Team, East Middle School, Shelby County (KY) Public Schools (2011-2012)

PROFESSIONAL AFFILIATIONS

American Educational Research Association (AERA)
    Teaching and Teacher Education Division

Association for Positive Behavior Support (APBS)

Council for Exceptional Children (CEC)
    Council for Children with Behavioral Disorders (CCBD)
    Teacher Education Division (TED)