The Effectiveness of an Evidence-Based Performance Feedback Intervention Through Zoom Communications, Inc.

Kristen Mahony

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THE EFFECTIVENESS OF AN EVIDENCE-BASED PERFORMANCE FEEDBACK INTERVENTION THROUGH ZOOM COMMUNICATIONS, INC.

A Dissertation
Submitted to the School of Education

Duquesne University

In partial fulfillment of the requirements for
the degree of Doctor of Philosophy

By
Kristen Elizabeth Mahony

August 2022
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Kristen Elizabeth Mahony

2022
THE EFFECTIVENESS OF AN EVIDENCE-BASED PERFORMANCE FEEDBACK INTERVENTION THROUGH ZOOM COMMUNICATIONS, INC.

By

Kristen Elizabeth Mahony

Approved June 21, 2022

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ABSTRACT

THE EFFECTIVENESS OF AN EVIDENCE-BASED PERFORMANCE FEEDBACK INTERVENTION THROUGH ZOOM COMMUNICATIONS, INC.

By

Kristen Elizabeth Mahony

August 2022

Dissertation supervised by Elizabeth McCallum, Ph.D.

The current study was conducted during the COVID-19 pandemic after the American Psychological Association (APA) called for modified research practices to ensure the safety of students and families. The evidence-based writing fluency intervention known as the Performance Feedback (PF) Intervention was implemented via a fully remote platform. A single-subject multiple-baseline across participants design was utilized to evaluate the effects of the adapted intervention on the writing skills of three elementary-aged students with disabilities while also measuring maintenance of those skills two weeks following the intervention. Additionally, researchers measured the social acceptability of the virtual PF intervention by the students. Visual analysis of results indicated writing fluency gains, measured by total words written (TWW), were made and maintained across all participants, regardless of baseline performance. Visual analysis of
writing quality, measured by correct writing sequences (CWS), indicated growth occurred and was maintained in only two participants. To further evaluate intervention effects, researchers calculated two effect sizes (WC-SMD and NAP) which revealed moderate to large treatment effects, corroborating visual analyses. Discussion focuses on implications for providing the PF intervention to students with disabilities, implications for providing the PF intervention in a virtual environment, as well as potential future direction for research.

*Keywords:* Writing fluency, writing intervention, remote instruction, performance feedback writing intervention, virtual learning, students with disabilities
DEDICATION

To my parents– Many scholars and authors have attested over the years, parents can give their children two unbelievable gifts, one is roots, the other is wings. Without hesitation, throughout my life, I have been fully gifted both blessings. Words cannot describe how thankful I am for you being supportive, wonderful, and loving parents. You have always helped me find my journey and path in life even when I was not sure of where it would lead. Through the trials and tribulations that life has given us along this journey, your support has remained constant. From my childhood to this very moment as I write this dedication as one of the final steps of my doctoral degree, you have always guided me to find my true calling and not allow any fear to conquer my destiny. I am not able to express my gratitude enough. This path, degree, and journey would never have been possible without you. I love you both deeply.

To my fiancé – Youseph, you have been, will continue to be, and always will be the calm to my storm, organization to my chaos, and number one supporter. You have given me endless support throughout this journey, continuously making sacrifices, while tirelessly encouraging me to persevere, so that I could achieve my dreams. I have lost count the number of times that I have found strength in you, your love, your advice, and your boundless faith in me. I know that you have helped me become a better woman, both professionally and personally every day. I could not be happier to have shared this journey with you and attribute many of my successes to you. I love you.
To my friends, family, and loved ones – Thank you for your endless support and all the ways you have individually helped throughout my education. I am honored and grateful to have had you all to provide limitless reassurance and guidance.
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To my committee member, Dr. Rattan, thank you for offering your expertise in academic interventions and kind, supportive, and constructive feedback throughout this process. This project would not have been possible without you.
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Chapter I: Introduction

The Importance of Writing

One of the critical advances in human evolution has been the ability to transcribe thoughts into written form. Indeed, writing is a powerful tool with which humans learn and communicate thoughts to others. Writing development is essential for success throughout school, but also in the modern-day workforce. In fact, education and employment depend on the written word for the acquisition and expansion of knowledge (National Commission on Writing, 2004; Patterson & Duer, 2006). Unfortunately, research in the field of education has focused much more on the ability to read than the ability to write (Runge & Linaburg, 2022).

Despite its importance, written expression is often overlooked within the typical school curriculum. In recognition of this omission, the National Commission on Writing (2004) stated, “American education will never realize its potential as an engine of opportunity and economic growth until a writing revolution puts language and communication in their proper place in the classroom” (p. 14). This body voiced their concerns regarding written instruction being the “the Neglected R”, for which they called for a substantial increase in the amount of time and money that school districts devote to students’ writing.

Supporting the notion that writing receives far less attention than reading or mathematics instruction, it was reported that only 3% of elementary school students spend three hours or more on written assignments per week (The National Commission on Writing, 2004). Similar findings were reflected among high school students, in which 75% of high school seniors never received a writing assignment in history or social studies, and only 49% of these seniors reported being assigned papers of three or more pages. Additionally, without activities devoted to the building and nurturing of students’ writing skills in their early years of schooling, the task is then passed
According to the National Writing Commission on Writing (2004), many college freshmen are unable to synthesize information, analyze arguments, or to construct written assignments that are relatively free of language errors. This body succinctly states, “the writing weaknesses of incoming college students costs our campuses up to $1 billion annually” (2004, p. 14).

Like reading, proficient writing performance is an important life skill for high school students as they prepare to enter college and/or the workforce. Unfortunately, many adolescents do not attain proficiency in writing (Graham & Perin, 2007; National Center for Education Statistics, 2012). Instructional inadequacies in writing are evident in the performance of students on national assessments of written expression. Confoundingly, since the National Commission on Writing in America’s Schools and Colleges (2004) was published, proficiency in written expression has not substantively improved. A bleak outlook for writing is further affirmed through the most recent national assessment, where only one quarter of 8th and 12th grade students were proficient in writing (National Center for Education Statistics, 2011).

**Crucial Call to Prevent Further Educational Regression**

In addition to the writing crisis that the United States has been experiencing for decades, the Coronavirus 2019 (COVID-19) pandemic has shaken our educational systems to the core. In late 2019, a virus was identified that quickly grew to the scale of a global pandemic and is likely to persist for the foreseeable future (Farmer et al., 2020). As this threat emerged, federal, state, and local authorities were called to take necessary actions, forcing students, their families, and education professionals to face a new reality that included remote learning practices, and drastically reduced face-to-face educational services (Horesh & Brown, 2020).

Many local educational agencies (LEAs) across the country began to deliver instruction
via an online format. Given the pandemic’s potential for negatively impacting students’ social, emotional, psychological, and academic well-being (Golberstein et al., 2020), it is imperative that educators find safe and effective means of delivering evidence-based practices to prevent students’ educational backsliding. Accordingly, in response to the COVID-19 pandemic, the National Association of School Psychologists (NASP) disseminated a call for empirical research submissions related to COVID-19 and school psychology. One such avenue for study includes modifications to traditional social, emotional, and/or academic interventions that can be safely delivered remotely.

Recently, some research efforts have focused on developing evidence-based interventions to improve the writing performance of school students. One intervention that has been shown to be successful in improving students’ writing fluency is the performance feedback intervention (Eckert et al., 2006). In light of the current pandemic and resultant need for social distancing practices, the purpose of this dissertation will be to evaluate the effectiveness of a modified version of the performance feedback intervention which utilizes a virtual platform.

**Literature Review**

Researchers have explored the effectiveness of providing feedback to promote academic performance in written expression. The empirical base for performance feedback has grown to include a variety of intervention studies using various methodological designs.

**1970-1980’s Research**

Derived from behavioral theory, as an early consideration of performance feedback, students were asked to respond to feedback about their completed written work, and implement the feedback received to improve their writing. Van Houtsen and colleagues were the first to test this link across various studies by examining the effectiveness of self-score performance
feedback on students’ writing fluency as a part of a combined intervention package. Their results showed a substantial increase in the improvement of students’ writing rate (i.e., words written per minute). However, due to the methodological limitations (e.g., combination of independent variables including explicit timing, tangible rewards, self-scoring, and public posting of individual performance), it was impossible to claim a singular relationship between writing fluency and performance feedback (Van Houten, 1979; Van Houten et al., 1974; Van Houten et al., 1975). Still, these studies were the first to illustrate performance feedback as a potentially beneficial intervention for written expression.

1990’s Research

Rather than examining performance feedback as part of a combined intervention package, Harris et al. (1994) sought to examine the effects of performance feedback on the writing skills of students with learning disabilities. This was conducted by using a multiple baseline design across participants, in which results indicated that students’ writing fluency increased over the course of 60 sessions, and that self-counting written words was an effective form of performance feedback for improving writing fluency. Although these results supported the use of performance feedback as a tool to improve the composition length of elementary-aged students with learning disabilities, this study was limited in terms of its generalizability. Additionally, as the researchers did not control the amount of time allotted for the writing task, writing rates were not obtained.

Current Perspectives

Previous studies have demonstrated the positive impact that performance feedback can have on students’ writing skills. However, further research was needed to examine the effectiveness of performance feedback in isolation and within the general education classroom. For that reason, Eckert et al. (2006) conducted two studies in which the authors randomly
assigned students to either a performance feedback condition or control condition. Results from this experimental design addressed many of the limitations associated with Van Houten and colleagues’ (1974, 1975) and Harris et al.’ (1994) research. Over a period of 8 weeks, students in the control condition received weekly writing practice without the use of performance feedback, while students in the performance feedback condition received a weekly intervention in which they were provided with individualized feedback regarding their writing fluency performance. Results indicated that students who received performance feedback experienced a significant improvement in writing fluency ($d = 0.65$, CI = $+0.25$ to $+1.06$) compared to those students who received practice alone. Eckert et al. (2006) reported the results of a second study that further supported the use of performance feedback methods to improve elementary-aged students’ writing fluency and showed that the procedures were equally effective regardless of the frequency of their implementation (i.e., once a week vs. three times a week; Eckert et al., 2006). The research findings reported by Eckert et al. (2006) suggest that performance feedback in isolation could be effectively used to increase writing fluency outcomes among typically developing elementary-aged students. However, evidence of generalization and maintenance of the intervention effects were limited (Hier & Eckert, 2014).

**Further Development of Performance Feedback Intervention**

Various randomized control trials (Eckert et al., 2006; Hier & Eckert, 2014, 2016; Hier & Mahony, 2017; Koenig et al., 2016; Truckenmiller et al., 2014) have demonstrated the effectiveness of the performance feedback intervention introduced by Eckert et al. (2006). Each of these randomized control trial studies has incorporated different variables to improve this performance feedback intervention, which will be discussed briefly in detail.

To address the limitations of Eckert and colleagues’ (2006) procedures, Hier and Eckert
(2014) sought to examine whether students who received performance feedback had greater maintenance and generalization of their writing skills, as compared to students who received practice alone. Results indicated that in isolation, performance feedback may produce short-term desired effects in students’ writing fluency growth; however, explicit programming of generalization may be required to produce long-term achievement gains. Truckenmiller and colleagues (2014) conducted the first study to compare rates of writing fluency growth between students who participated in the performance feedback condition compared to a control group.

Koenig et al. (2016) sought to explore goal setting and its impact when incorporated within the performance feedback intervention to improve students’ writing fluency. Due to their insignificant findings in 2014, Hier and Eckert (2016) sought again to research the maintenance and generalization of students’ writing fluency by implementing multiple exemplar trainings into the intervention. Furthermore, Hier and Mahony (2017) examined how students’ writing self-efficacy developed along with elementary-aged students’ writing fluency.

Although this performance feedback intervention had been found to be successful with typically developing students’ writing fluency, its isolated effects for students with disabilities was unknown. Due to this, Hier and McCurdy (2019) sought to examine whether the writing fluency gains of this particular performance feedback intervention could be replicated with students with Oppositional Defiant Disorder (ODD). Preliminary evidence of this evidence-based performance feedback writing intervention showed that it only led to writing gains in one out of three students with ODD, failing to support the intervention effectiveness across participants.

The Problem Statement

At present, there are various studies that have examined the effectiveness of the
performance feedback writing intervention on students’ writing fluency growth through an in-person intervention. Currently, this performance feedback intervention is an evidence-based intervention for improving elementary-aged students’ writing fluency. Of note, all previous studies have measured the impact of this intervention with students using an in-person (face-to-face) format. Recently, due to the coronavirus (COVID-19) pandemic, many have been forced to teach, counsel, and intervene with students solely through an online format to adhere to the United States Center for Disease and Control and Prevention (CDC) and local government guidelines. The current study will replicate the procedures of the performance feedback intervention via a fully remote platform.

**Research Questions and Hypotheses**

**Research Question 1:** Does the performance feedback writing intervention provided via an online format increase the writing fluency of three students with disabilities as measured by total words written (TWW)?

*Hypothesis 1:* The performance feedback writing intervention provided via an online format will increase the writing fluency of three students with disabilities as measured by total words written (TWW).

**Research Question 2:** Does the performance feedback writing intervention provided via an online format increase the writing quality of three students with disabilities as measured by correct written sequences (CWS)?

*Hypothesis 2:* The performance feedback writing intervention provided via an online format will increase the writing quality of three students with disabilities as measured by correct written sequences (CWS).

**Research Question 3:** Do students with disabilities find the performance feedback writing
intervention provided via an online format socially acceptable?

Hypothesis 3: Students with disabilities will find the performance feedback writing intervention provided via an online format to be socially acceptable.

Summary

National data and empirical evidence have suggested the pressing need to improve students’ writing skills in the early elementary grades (Persky et al., 2003; NAEP, 2011). Increasingly, research efforts have been made to improve students’ writing skills through the use of the performance feedback intervention (Eckert et al., 2006; Hier & Eckert, 2014, 2016; Hier & Mahony, 2017; Koenig et al., 2016; Truckenmiller et al., 2014). Although randomized control trials have been successful in promoting students’ writing skills using an in-person format, the effects of this intervention are unknown within a fully remote platform. Through the current study, I propose to investigate the use of the performance feedback intervention with students through an online format, Zoom Communications Inc. Specifically, this study will explore the effectiveness of the performance feedback intervention on students’ writing fluency gains within an online format, significantly adding to the existing literature base.
Chapter II

Historical Background

Proficient writing is a vital skill for students, as it is an essential requirement for participation in academic environments (Graham & Perin, 2006). Writing allows students to share information with others and to communicate their knowledge. Wen and Coker Jr. (2020) explored the relationship between beginner writers and discourse knowledge, where results yielded a consistent relationship between written achievement and spring discourse knowledge. Furthermore, given the relationship between the development of writing and reading skills, scores on writing CBMs and reading are highly correlated (Runge & Linaburg, 2022).

There is a vital need for improvement in students' writing skills in the elementary grades. Although researchers have highlighted the importance of developing adequate writing skills within the school context, the most recent available national assessment results suggest that nearly three-quarters of students fail to meet grade-level proficiency standards in writing (National Center for Education Statistics, 2017). These reported low levels of writing proficiency at the elementary level are of primary educational concern, as writing is used to assess students' understanding of academic material (Graham & Perin, 2007), and students with weaker writing skills are at a higher risk for school dropout (Spengler et al., 2018).

Writing fluency has been identified as an appropriate target for intervention in the elementary grades (Steinman, 2018). Recently, intervention efforts have aimed to improve students' writing fluency, among other areas of writing need. Cognitive explanations suggest that instead of focusing on tedious tasks of getting words on paper, fluent writers are better able to preserve their cognitive resources for higher-level writing skills (e.g., content knowledge, composition planning; Deno et al., 1980; Graham et al., 1997).
Remote Assessment and Intervention

Within the current body of literature, there is a lack of research that has been conducted in the realm of remote instruction, assessment, and intervention. The COVID-19 pandemic abruptly mandated society to adhere to physical distancing guidelines, forcing the closure of worldwide public-school systems. In the wake of these directives, the role of technology for the delivery of instruction, assessment, and intervention for students has never been more crucial within the educational system. For instance, during the peak of the pandemic, school psychologists and administrators had an important, yet difficult decision to make whether to defer assessment until traditional testing was deemed viable or to adopt teleassessment procedures (Farmer et al., 2020).

Although public health concerns may constitute an accumulating risk to the success of our students due to delayed educational intervention (Lee, 2020; Marcotte & Hemelt, 2008; Van Lancker & Parolin, 2020), we also must be cognizant of the legal and ethical issues surrounding such adaptations (Farmer et al., 2020). For example, at some point during the pandemic many school districts transitioned from traditional instruction to fully remote instruction, while offering telepsychology for the continuation of counseling services. However, transitioning from in-person assessment (i.e., standardized individual intelligence and achievement tests) to remote assessment procedures is not so easily accomplished, as the norm-referenced assessments with which we collect critical data have been standardized through in-person implementation. Farmer and colleagues (2020) argued that school-based teams and psychologists provide educational and clinical decisions based on data they obtain from norm-referenced assessments for which these decisions can affect the student’s intervention services, placement, and their long-term success (or failure). Thus, due to the role that standardized data plays in these high stakes decisions for
diagnostic purposed, it is imperative that practitioners rely on data that are valid for those purposes (American Education Research Association [AERA], 2014). Given the unknowns surrounding teleassessment in the realm of intelligence and achievement testing, the high stakes decisions that are made from the data collected from such assessments, and the potential long-term outcomes on the student affected, psychologists must proceed with extreme caution in these areas.

Even though there is the need for the utmost consideration when conducting teleassessment for intelligence and achievement testing, there are other areas educators and researchers should consider in attempting to reduce educational regression during and following the pandemic. In fact, researchers have been called by the American Psychological Association (APA) to modify our research practices to ensure the safety of children and families in light of current conditions (Clay, 2020). One vital academic skill that continues to demonstrate significant need, students’ writing fluency, may be an area that researchers can target remotely. This would not only reduce the potential regression associated with virtual and hybrid schooling, but also address the United States’ current writing crisis.

**Performance Feedback and Writing Fluency**

One method that has been used to target writing fluency is performance feedback (PF). Several randomized controlled trials have documented significant improvement in third-grade students’ writing fluency through the use of (PF; Eckert et al., 2006; Hier & Eckert, 2014; 2016; Hier & Mahony, 2017; Koenig et al., 2016; Truckenmiller et al., 2014). In these studies, students received weekly writing practice on a curriculum-based measurement probe in written expression (CBM-WE; Shapiro, 2004). At the beginning of each session, students were provided with feedback regarding their writing performance from the previous session. The feedback was
provided in the form of a sheet of paper containing the total number of words they wrote during the previous week's probe along with an up arrow indicating improvement or a down arrow indicating decline in their writing production. The results of these studies revealed that students who received the PF intervention showed significantly greater growth in writing fluency over time compared to students who did not receive PF. This intervention can be implemented within the school setting. Additionally, teachers viewed this intervention as acceptable (e.g., Hier & Eckert, 2014), it is time-efficient (i.e., 15 minutes once per week), and can be implemented class-wide. Furthermore, research shows that students can act as each other’s PF intervention agents, minimizing teachers’ time requirements (Alitto et al., 2016).

**The Current State of Students’ Core Academic Performance in the U.S.**

The National Assessment of Education Progress (NAEP), published by the U.S. Department of Education, reports every four years on the national academic data of fourth, eighth, and twelfth-grade students. Student achievement levels are categorized into three levels: the Basic level indicates partial mastery of skills that are considered prerequisite to grade-level material, the Proficient level indicates competency with grade-level material, and the Advanced level represents above grade-level performance.

**Writing**

NAEP data suggest that writing is the nation’s weakest area in terms of core academic performance (reading, writing, and math). The most recent Nation’s Report Card data available for grade 4 are from 2002 and for grades 8 and 12 are from 2011. Specifically, NAEP data reveal that in 2002, 72% of fourth-grade students were not able to write with proficiency (i.e., display mastery of grade-level expectations). Additionally, when achievement gap data were analyzed for fourth-grade students, it was found that female students scored higher than male students,
White students scored higher than Black, Hispanic, Asian/Pacific Islander, and American Indian/Alaska Native students, and students with disabilities performed lower than students without disabilities.

In 2007, 67% of eighth- and 76% of twelfth-grade students were not able to write with proficiency, and in 2011, 73% of eighth- and 73% of twelfth-grade students were unable to write proficiently (National Center for Education Statistics, 2012). A new NAEP Writing Framework was developed for the 2011 assessment, leaning away from a typical writing assessment (i.e., handwriting on paper), where students' writing skills were to be assessed using computers. Through this 2011 assessment, achievement gap results were also obtained for students in eighth grade. Results yielded were identical to the 2002 grade four data, with additional data indicating that students who were eligible for the National School Lunch Program (NSLP) scored lower compared to students who were not eligible.

In 2017, students in grade 4 and grade 8 completed the assessment using tablets. When preliminary analyses of students’ writing performance in the 2017 NAEP writing assessment occurred, potentially confounding factors in measured performance were found. Consequently, NCES is conducting additional analyses and plans to release a special report on the 2017 NAEP writing assessment.

**Theoretical Foundations for the Writing Process**

Existing models of writing are pillared by cognitive and neuropsychological aspects of the writing process. Researchers have suggested that cognitive and neuropsychological factors are of marked importance for the development of written expression. A review of the literature in this area has identified four main cognitive functions that play a role in written expression. Hooper et al. (2009) suggested these four areas are visual-spatial skills, graphomotor output (i.e.,
planning and control of finger function, orthographic coding), memory, and executive functioning (e.g., organization, planning, attention, initiating, and sustaining). Two longstanding models of writing that draw attention to some of these highlighted functions are reviewed below.

**Hayes’ and Flower’s (1980) Model of Writing**

Perhaps the most cited model of writing, Hayes and Flower (1980) suggested that the writing process is comprised of three components (i.e., planning, translating, and reviewing/revising the written product; see Figure 1). First, Hayes and Flower proposed that individuals first engage in planning, in which they focus on idea generation, organizing, and goal setting concerning their written work. Following the planning stage, individuals convert language representations into orthographic text (i.e., translation), where it is hypothesized that translation relies heavily on the transfer of ideas in working memory. Lastly, upon completing the translation stage, individuals review, evaluate, and revise their written work.

**Berninger’s Model of Writing**

Berninger and colleagues (2000) proposed the Simple View of Writing to incorporate the various components of the functional writing system, such as working memory (McCutchen, 1996; Swanson & Berninger, 1996), and the cognitive processes of planning, reviewing, and revising (Hayes & Flower, 1980). They argued that the Hayes and Flower (1980) model was more relevant to the adult writing process, contending that translation plays a significant role in the writing process for children who are still developing emergent writing skills. Children who have not yet acquired the lower-level process of text production may experience difficulties engaging in higher-level cognitive processes (i.e., planning and revision). Consequently, Berninger and colleagues (1992) proposed a model that highlighted the importance of translating for emerging writers, where the component of translation was broken into two sub-components:
text generation and transcription (see Figure 2.). For text generation to be accomplished, first, ideas need to be transformed into linguistic representations in working memory. It is suggested that children first form linguistic representations and then engage in transcription, a process of transferring these linguistic representations into motor output.

Additionally, Berninger and colleagues (2006) argued that transcription is directly related to the mechanics of writing (e.g., spelling, punctuation, and grammar), handwriting, and compositional fluency. The length and quality of compositions are related to two transcription skills: spelling and handwriting. Graham et al. (1997) examined the impact of compositional fluency and quality by administering measures of handwriting and spelling to 600 first- through sixth-grade students. In order to measure writing fluency and quality, students were asked to write two compositions. Their writing fluency was calculated by counting the number of total words written per 5 minutes, and writing quality was assessed by averaging the Likert scale ratings (1 = considerably below grade expectations, 5 = considerably above grade expectations; Graham et al., 1997). Writing quality was rated based on content and organization by two experienced teachers. Results of this study revealed that at both the primary (i.e., first- through third grade) and intermediate (i.e., fourth- through sixth grade) levels, spelling and handwriting accounted for a significant portion of the variance observed in writing fluency (41% to 66%) and writing quality (25% to 42%).

Further research conducted by Berninger et al. (1994) provided additional support that spelling, and handwriting play a noteworthy role in the writing process for children. This study consisted of 300 fourth- through sixth-grade students completing a large series of psychoeducational, neuropsychological, and cognitive tests that included measures of writing skills. Results stipulated that writing fluency and quality were statistically significantly
correlated with dictated spelling and handwriting, but that writing fluency was not significantly related to spontaneous spelling (i.e., spelling within the context of the students’ compositions). However, the writing quality was related to this skill. Results suggest that for elementary-aged children, spelling and handwriting play a large role in writing ability.

**Curriculum-Based Measurement Probes in Written Expression**

Deno (1985) developed Curriculum-Based Measurement (CBM) as a brief tool to assess academic behavior in several curricular areas, where brief measures are administered repeatedly to examine students’ skill development over time. For the purpose of this paper, CBM in Written Expression (CMB-WE) will be discussed and implemented as a measure of writing fluency. CBM-WE probes were developed based on procedures outlined by Shapiro (2004).

First, it is suggested that a series of “story starters” are constructed that are used to give the initial ideas for students to write about. When developing story starters, consideration is given to the type of discourse that is being assessed. The most typical assessment of written language uses narrative story starters. Additionally, these starters should be of adequate interest to most students to generate a written story. AIMSweb (2016) does offer a set of story starters for the evaluator’s use. Second, the evaluator gives students a copy of the story starter, reads it to them, and tells them that they will be asked to write a story using the starter as the first sentence. Students are then given 1 minute to think about a story before they are asked to begin writing. Third, after 1 minute, the evaluator tells students to begin writing, starts a stopwatch, and times for 3 minutes. If students stop writing during the 3 minutes, they are encouraged to continue to write until the time is up. Lastly, the evaluator counts the number of words that are correctly written, in which “correct” is defined as a distinct word that can be recognized (even if misspelled). Punctuation and capitalization are ignored, and the title is also counted if the student
wrote one. The rates of correct and incorrect words per 3 minutes are then calculated. If students stop writing prior to the 3-minute time mark, the number of words correct are divided by the amount of actual time (in seconds) spent writing, and this number is multiplied by 180 for the number of words correct per 3 minutes.

Despite the fact that many CBM-WE outcome measures have been evaluated as potential indicators of writing fluency, correct writing sequences (CWS), words spelled correctly (WSC), and total words written (TWW) are the three most common measures used to assess writing fluency amongst elementary-aged students (Espin et al., 2000). Comprehensive reviews of studies have been conducted (McMaster & Espin, 2007; Powell-Smith & Shinn, 2004) that have explored the technical adequacy of CWS, WSC, and TWW. Overall, interscorer agreement (range, 91% to 99%) for total words written and correctly spelled words and reliability coefficients (range, \( r = .51 \) to .99) were moderate to high. Furthermore, in later studies, CWS have demonstrated high alternate-form reliability (\( r = .79 \) to .95; McMaster et al., 2010), high incremental slope reliability (\( r > .70 \); McMaster et al., 2010), and high criterion validity (\( r = .57 \); Furey et al., 2016).

**Writing Fluency**

Writing fluency (i.e., automaticity and proficiency in transcription) has been targeted and supported by Berninger and colleagues’ research as a rudimentary skill in the writing process that must be developed in the elementary grades (Abbott & Berninger, 1993). In the execution of complex skills, developing fluency has typically been conceptualized within the context of automaticity theory. This theory states that students demonstrate automatic, or fluent, responding when they can complete a task with speed and accuracy (Samuels, 2006). Automaticity has been studied in a variety of areas in psychoeducation (e.g., Cummings et al., 2011; Frye & Gosky,
The measurement of fluency (speed and accuracy) involves examining the accuracy rate with which a response is produced (i.e., correct responses per an allotted period; Mathson et al., 2006).

The evaluation of writing fluency involves examining the speed and accuracy with which an individual writes within an allocated time frame (Shapiro, 2004). From a cognitive standpoint, the ability to write fluently allows children to expend fewer cognitive resources on basic writing components (spelling, handwriting, etc.). When this is accomplished, the student then has more cognitive resources (i.e., working memory) to devote to higher-level writing components (i.e., composition planning and content knowledge; Graham et al., 1997). In addition, the capacity theory of writing was proposed by McCutchen (1996; 2000) and suggests that as writing processes become more efficient, working memory resources become less necessary. Accordingly, when a student is exposed to a task (i.e., writing) through practice, they begin to move into a more automatized process in their writing. Within this framework, cognitive effort refers to the fraction of the working memory resources that are momentarily allocated to the writing task (McCutchen, 2000). Thus, cognitive effort is the extent to which the writing processes have been automatized.

Olive et al. (2009) demonstrated that cognitive effort in text writing decreased as grade level increased due to students having a more automatized writing process (Olive et al., 2009). Ninth-grade students exhibited less cognitive effort and encountered less difficulty in writing texts compared to fifth graders. Fifth-grade students' writing fluency was not affected by the type of text they were required to write (e.g., narrative or argumentative).

On the other hand, from a behavioral perspective, fluent responding is likely to result in
improved retention of a skill, persistence of a skill over longer intervals, stability of a skill in spite of distractions, application of a skill to novel conditions, and spontaneous modification of a skill (see Johnson & Layng, 1996; Martens & Collier, 2011). Thus, students who write fluently are more likely to: (a) retain their skills in absence of practice, (b) sustain their performance over longer time intervals, even in the face of distractions, (c) transfer their writing skills to novel writing tasks, and (d) modify their writing skills to meet environmental demands. For writing competence to be established, The National Writing Project (2003) has deemed the development of writing fluency an essential skill. Writing fluency has also been found to be correlated with writing quality (Deno et al., 1980; Van Houten et al., 1974), and criteria and standardized measures of writing achievement (McMaster & Espin, 2007; Powell-Smith & Shinn, 2004). Additionally, fluency has been shown to be related to post-secondary educational success, as the basic skills of transcription fluency continue to be important in college. Specifically, researchers found that in the United States, only 25% to 38% of secondary education graduates are proficient writers. Many of these students decide to continue into postsecondary education, however, they are taking developmental education course that are designed to help improve those basic academic skills (Perin & Holschuh, 2019).

Research findings suggest that as writing fluency is an important indicator of academic success, it should be established in the elementary grades for optimal outcomes and continue to be an essential foundational skill in the post-secondary setting. However, substantial evidence suggests that elementary-aged students do not spend a sufficient amount of time practicing writing in the classroom (Cutler & Graham, 2008). This lack of opportunity to establish writing fluency skills in the elementary grades is highly problematic, particularly because most schools do not continue formal writing instruction after the elementary grade levels (Smith, 2004). The
National Assessment of Educational Progress (NAEP 2012) reported that in the area of writing, only about 27% of students perform at or above the proficient level.

**Performance Feedback Theoretical Foundation**

According to Hattie and Timperley (2007), performance feedback can be conceptualized as “information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one’s performance or understanding” (p. 81). These researchers state that feedback exists along a continuum, with a clear distinction between feedback and instruction at one end and a complete overlap between the two at the other end. When conceptualized in this manner, feedback becomes a type of instruction when it is provided in a corrective manner.

From a theoretical standpoint, performance feedback has been considered to be cognitive-behavioral in nature. Locke et al. (1981) stated that first individuals must understand and apply the new information they learn from performance feedback, after which their thoughts about subsequent behavior will change. Further, Kulhavy (1977) argued against a purely behavioral perspective on performance feedback. He contended that the behaviorist feedback does not function as a reinforcer. Specifically, the information provided via feedback can be accepted, modified, or rejected by its receiver; thus, feedback in isolation is not a reinforcer. While theorists may conceptualize the effects of performance feedback differently, one commonality regarding performance feedback is the positive effect this process can have on an individual’s performance, which is arguably crucial to the overall learning process. Eckert et al. (2006) suggested that the delivery of feedback is a “long-standing method of instruction based on E.I. Thorndike’s law of effect” (p.169).

For example, Thorndike (1931) conducted a study in which adults were explicitly informed whether their guesses to word-meaning associations were correct or incorrect.
Specifically, those who received feedback were more likely to make correct associations in the future compared to participants in a control condition. It has been argued that feedback can manipulate one's cognitions as well as their behavior. Furthermore, when an individual is provided with feedback that incorporates the correct or appropriate behavior, the learning process is positively influenced. Essentially, the delivery of feedback reinforces the stimulus-response association (Eckert et al., 2006). A cognitive component is also relevant to the concept of performance feedback. When feedback is provided, it is believed that an individual thinks about the feedback they have received, and then incorporates the feedback into their learning process (Eckert et al., 2006).

**Performance Feedback and Writing**

Graham et al. (2011) stated that “a long-term staple of writing instruction is for teachers to provide students with feedback about one or more aspects of their writing” (p. 17). It is recommended that feedback is elaborate, specific, and explicit (Baker et al., 2003), and it is believed that improvement in students’ writing skills can occur when students are provided with feedback regarding the effectiveness of writing (Graham et al., 2011).

Truckenmiller et al. (2014) stated that PF is considered a resourceful evidence-based instructional intervention. Numerous studies have demonstrated the effectiveness of PF in improving elementary students' writing fluency skills. The following is a review of past literature that has incorporated various methods of the PF intervention to improve students’ writing fluency skills.

In a series of single-case experimental design studies, Van Houten and colleagues documented the effectiveness of PF on elementary-aged students acquiring basic writing skills. One of the original studies examined the effectiveness of self-score PF on students’ writing
fluency as a part of a combined intervention that involved explicit timing, goal-setting, and public posting of scores (Van Houten et al., 1974). Participants (i.e., 21 second- and 34 fifth-grade students) were (a) given 10 minutes to write a composition, (b) instructed to count their total words written (TWW) upon completion of the writing task, (c) able to see each student’s highest score on a chart in the classroom, and (d) instructed to attempt to beat their score during subsequent writing sessions. Results showed that the combination of PF, goal setting, and public posting of students’ writing performances led to a substantial increase in improvement of students’ writing rate (i.e., words written per minute) for both second- and fifth-grade students. However, due to the packaged nature of this intervention, it was impossible to evaluate the effects of PF in isolation.

The following year, Van Houten et al. (1975) conducted a follow up study involving two fourth-grade classrooms investigating the effects of PF alone on students’ writing fluency. Through a reversal design, students were individually introduced to self-scored PF, public posting of scores, and verbal teacher praise. Results indicated that the element of PF alone doubled the writing rate of students compared to their baseline levels of performance. The combined components of the intervention package (PF and public posting of scores) improved students’ writing rate by an additional 2.2 words per minute. Teacher praise increased the writing rate of one classroom by an additional 2.2 words per minute but did not have a significant effect on the writing rate of the other classroom.

In 1994, rather than examining PF as a part of a larger intervention package, researchers utilized a multiple baseline design across participants to examine the effects of PF on students’ writing skills (Harris et al., 1994). Four students with learning disabilities in the fifth and sixth grade participated in a 15-minute writing session, where they were presented with a teacher-
selected picture prompt and were then asked to respond by writing a story. Upon completing their written response, students were asked to score their writing responses by counting their total words written, with the self-counting of total words written serving as the performance feedback. Results showed that students’ writing fluency increased by an average of 59.25 words over the course of 60 sessions, and that self-counting was an effective form of performance feedback to improve students’ writing fluency. However, the researchers failed to control the amount of time for the writing task, so the writing rate could not be obtained.

Even though these studies demonstrated the positive impact that performance feedback can have on students' writing fluency skills, further research was needed to examine the effects of PF in isolation and use with students in the general education setting. Therefore, in 2006, Eckert and colleagues randomly assigned 50 third-grade students to either a PF condition or control condition. Over the course of 8 weeks, students in the PF condition received a weekly intervention in which they were provided with individualized feedback regarding their writing fluency performance, and students in the control condition received weekly writing practice without performance feedback. Results indicated that students who received performance feedback demonstrated significantly greater increases in their writing fluency \((d = 0.65, CI = +0.25 to +1.06)\) and spelling \((d = 0.74, CI = +0.33 to +1.14)\), compared to the control group. A second study conducted by Eckert et al. (2006) that examined the impact of the frequency of PF implementation (i.e., once a week or three times a week) further supported the use of these performance feedback methods and established that the procedures were effective regardless of their frequency of implementation.

Hier and Eckert (2014) examined whether students who received PF had greater maintenance and generalization of writing skills, compared to those who received practice alone.
For 6 weeks, 51 third-grade students received performance feedback regarding their writing fluency (i.e., the total number of words written per 3 minutes), and 52 third- grade students were assigned to a practice-only condition. Maintenance of the intervention effect was examined at 2-, 4-, and 6-weeks post-intervention. Outcomes of this study indicated that students in the PF condition demonstrated significantly greater initial and generalized writing fluency improvements (i.e., a transfer of writing fluency gains from probes containing both orally- and visually presented writing prompts to probes containing only orally presented writing prompts) compared to the practice-only condition. However, maintenance results favored the practice-only condition. These findings suggested that, in isolation, PF may produce short-term desired effects on students’ writing fluency growth, but to produce long-term achievement gains, explicit programming of generalization may be required.

Truckenmiller and colleagues (2014) conducted a randomized control trial to examine the effectiveness of PF and fluency-based intervention. This was the first study to compare rates of writing fluency growth between students who participated in the PF condition compared to a practice-only and instructional control condition. Over the course of 7 weeks, 133 third-grade students across three schools were assessed. Results indicated that students who received PF demonstrated significant improvement in their writing fluency compared to the control group. After the study, students who participated in the PF condition exhibited an average of 41.6 TWW, compared to the standard benchmark of 37 TWW per three minutes of writing at this grade level for CBM-WE tasks. Furthermore, results yielded support for PF as an instructional component within the general education classrooms, however, the practice alone condition with CBM-WE did not produce results that were significantly greater than standard instructional practices.
Through the use of a randomized control trial, Koening et al. (2016) examined the use of performance feedback and goal setting to improve students’ writing fluency growth. The writing fluency growth of 115 third grade students was examined through students participating in a PF intervention combined with a pertinent goal-setting component (n = 38), compared to a PF condition alone, (n = 39) and a control (n = 38) condition. In an effort to improve the feedback standard gap, the second condition combined PF with a pertinent goal-setting component by including three additional intervention components: (a) a fluency goal, (b) immediate (i.e., self-scored) feedback, and (c) self-graphing of performance. Over the course of the study, students in the two PF conditions demonstrated significant improvement in their writing fluency, averaging a weekly gain of approximately 1.88 to 2.11 CWS. In contrast, students who participated in the control condition averaged a weekly gain of less than one CWS. The pertinent goal-setting component did not improve students’ writing fluency more than the PF alone.

Although performance feedback procedures have shown short-term improvement in elementary-aged students’ writing skills, the area of research within maintenance and generalization was until recently fairly limited. Through a randomized controlled trial, Hier and Eckert (2016) examined the immediate, generalized, and sustained effects of incorporating multiple exemplar training into performance feedback procedures of a writing intervention. Participants in the study included 118 students from third-grade general education classrooms in a rural setting. Students were assigned to one of three conditions: (a) a practice-only control condition, (b) PF only condition, and (c) a PF condition that incorporated multiple exemplar training (MET). The practice-only control condition received a writing packet containing only a curriculum-based measurement in written expression (CBM-WE). No feedback was given within this condition. Students within the PF-only condition also completed a CBM-WE probe, however
they received feedback regarding their performance from the previous session. Students within the MET condition received performance feedback similarly to the PF condition, but a few modifications were made. The writing probes alternated weekly between CBM-WE probes and generalization training probes. Results demonstrated that students within the PF-only condition showed significantly greater fluency growth over the 6-week intervention than students within the practice-only control condition. Although the combination of MET and PF did not improve students' writing performance on measures of response generalization and stimulus, it did result in greater maintenance over 4 months in the MET condition than the PF-alone condition did.

Hier and Mahony (2017) examined how a performance feedback intervention improved elementary-aged students’ writing fluency skills, and how their writing self-efficacy developed upon participating in these procedures. In this study, 117 second-grade students participated in the PF intervention. When baseline data to post-intervention data were compared, students reported higher levels of self-efficacy in their writing abilities after participating in the PF condition. Positive feedback and task mastery did not have an impact on writing self-efficacy; however, effort was a significant predictor of writing self-efficacy. The results of this study provided preliminary guidance for how the PF procedures may be refined to target students’ task effort more methodically in future research.

Particularly in the area of writing, students with oppositional defiant disorder (ODD) and other emotional and behavioral disorders (EBD) often have significant academic needs (Hier & McCurdy, 2019). Matthys et al. (2012) found that these students experience a variety of impairments in neurocognitive functioning that makes it difficult for them to develop proficiency with the writing process. For example, children with EBD have been shown to exhibit neurocognitive dysfunction when performing tasks that require sustained attention and cognitive
flexibility (i.e., higher-order thinking; Hobson et al., 2011; Rubia et al., 2010). On the broad written language component of the Woodcock-Johnson III Test of Achievement (Woodcock et al., 2001) at both the elementary and high school levels, Lane et al. (2008) reported that on average, students with EBD obtained scores within the 15th percentile. Early intervention that targets writing fluency is crucial (Berninger et al., 2006), provided that these students may be very likely to experience significant writing deficits and fail to “catch up” by high school (Splenger et al., 2018).

Performance feedback has been successfully used to improve typically developing students’ writing fluency, however its isolated effects for students with disabilities are unknown. Due to this, Hier and McCurdy (2019) suggested a need to identify intervention strategies that can be efficiently implemented in the school setting to improve the writing fluency of students with disabilities. Through the use of a multiple baseline design, Hier and McCurdy examined whether the writing fluency gains of an evidence-based performance feedback intervention could be replicated with students with ODD. Participants of this study included three African American students who had a psychiatric diagnosis of ODD. Results indicated that one student’s writing fluency improved during the intervention phase, however, the other two students’ performance did not improve. It is unlikely that the intervention procedures were too complex for the participants, as their baseline writing skills were similar to those of typically developing peers who have benefited from the intervention in previous studies (e.g., Hier & Eckert, 2016). Further research is needed to better understand the potential use of PF for students with significant behavioral needs such as students with ODD and other emotional disorders.

Datchuk et al. (2019) completed a meta-analysis of writing interventions for students with disabilities. This study examined the effects of interventions on the level and trend of text-
writing sequences of students with disabilities and writing difficulties. In addition, they examined potential moderating effects related to writing task (i.e., narrative, essay, sentence), and student demographics (i.e., disability status, age, gender, and race). A total of 15 single-case experimental design studies including 79 students were reviewed using mixed-effects linear regression, along with an information-theoretic ranking of competing models. Results indicated a gradual improvement in trend of CWS per minute was found when writing interventions, such as self-regulated strategy development, and direct instruction were employed. When compared, younger students showed a steeper trend during intervention, while older students produced higher levels of writing sequences. Additionally, students demonstrated higher levels of writing fluency when they completed a sentence-writing task, compared to a narrative or essay task.

**Summary**

Performance feedback is an empirically supported intervention to improve elementary-aged students’ writing fluency (Eckert et al., 2006; Hier & Eckert, 2014; 2016; Hier & Mahony, 2017; Koenig et al., 2016; Truckenmiller et al., 2014). The PF intervention is based on two theoretical foundations of writing, the Hayes’ and Flower’s (1980) Model of Writing and Berninger’s Model of Writing.

Although this intervention has been found to be successful in improving typically developing elementary-aged students’ writing fluency through an in-person class-wide format, the effectiveness of this intervention has not yet been explored through an online format. Due to the COVID-19 pandemic, the American Psychological Association (APA) has called for researchers to modify research and instructional practices (Clay, 2020). Additionally, although COVID-19 has forced our education system to function in an increasingly remote environment, our students’ learning and development must continue. There is currently an urgent need for
academic, social, and behavioral interventions that can be provided via remote platforms, ensuring the health and safety of students and educators, while reducing educational regression. The performance feedback intervention is one evidence-based academic intervention that has the potential to not only aid in the United States’ current writing crisis, but further support the prevention of educational backsliding during the COVID-19 pandemic.
Chapter III

Methodology

The effectiveness of an evidence-based performance feedback intervention for students through an online platform (i.e., Zoom Communications Inc.) was evaluated through a single-subject multiple-baseline across participants design. This intervention has traditionally been conducted through a class-wide format, with the exception of one study conducted by Hier and McCurdy (2019). However, a single-subject multiple baseline design was considered the most appropriate and advantageous to address the research questions. Baer and colleagues (1968) noted the utility of single-subject designs when conducting applied behavior research. While laboratory research provides the researcher the opportunity for stricter control over variables, applied researchers generally do not have this luxury. However, applied behavioral researchers still bear the responsibility of demonstrating adequate experimental control to reliably attribute behavioral change to the applied intervention.

Participants and Setting

The intervention phase took place in the midst of the novel coronavirus pandemic. In a public suburban school system in the Southwest region of the United States, students in the 2nd and 3rd grades were referred for participation by their teachers and administrators and were subsequently invited to take part in the virtual study. The intervention took place during school hours, in which students logged on via Zoom Communications Inc., to participate in the intervention for a 10-minute block of time. Prior to the implementation of the study, the special education teacher identified a convenient 10-minute block of time, a room that would be empty and would be available for the intervention. Immediately following the intervention, students
logged off of the Zoom Communications Inc. platform when the session was ended by the intervention agent.

**Participants**

Three elementary-aged students were included in this study. Participants included two third-grade students, Alanisse, and Carly, and one second-grade student, James who attended remedial academic services weekly through their Individualized Education Plans (IEP). Alanisse held a diagnosis of attention-deficit/hyperactivity disorder (ADHD) and a Speech/Language Impairment. Carly held a diagnosis of ADHD and James held a diagnosis of Autism. Both Alanisse and Carly were White students and James was a Hispanic/Latino student. Participants were selected because the special education teacher indicated that they struggled with their written expression skills. Throughout the entirety of this study, two of the students received weekly written expression through their IEPs.

**Inclusionary criteria.** Students were considered eligible for participation in the study if: (a) English was their primary language, (b) they did not experience severe motor deficits that prevented them from writing, and (c) were identified to be struggling with their writing skills.

**Experimenters.** Two school psychology doctoral students served as intervention agents. Intervention agents received training in administering and scoring dependent measures, conducting procedural integrity observations, interscorer agreement procedures, and data recording procedures. Procedural scripts were provided to the intervention agents for administering the dependent measures and conducting the procedural integrity observations (see Appendix A). Additionally, a manual that detailed scoring procedures for the dependent measures was provided (see Appendix B). Training was provided for all the procedures, followed by opportunities for the intervention agents to practice and receive direct feedback on
scoring writing probes. Prior to conducting the study, all intervention agents were required to demonstrate proficiency in administering and scoring dependent measures and conducting procedural integrity observations. These proficiency checks were verified by the principal investigator of the study.

**Measures**

First, the Duquesne University Institutional Review Board’s (IRB)-approved consent packets were mailed to the homes of the guardians of the students referred by teachers and/or administrators for participation in the study (Appendix C). Furthermore, during the initial session, students also gave assent using approved child assent forms (Appendix D). Throughout the study, measures were administered to assess the students’ written expression and writing fluency skills.

**Dependent Variable Measures**

**Curriculum-Based Measurement in Written Expression (CBM-WE)**

Curriculum-Based Measurement (CBM; Deno, 1985) are brief assessment measures of academic behavior that are both reliable and valid for production-independent measures (percentage of CWS) and production-dependent measures (i.e., CWS, TWW). For the purposes of this study, TWW and CWS CBM in Written Expression (CBM-WE) were used as a measure of writing fluency and writing quality.

CBM probes were taken from the AIMSweb program (2016), where prompts were chosen that were within the grade-level expectations appropriate to each individual participant. For example, researchers suggest that narrative prompts are deemed the most appropriate probe for elementary-aged students (McMaster et al., 2009). A complete list of included prompts can be found in Appendix E.
Correct Writing Sequences (CWS)

Consistent with the previous performance feedback randomized control trials (Eckert et al., 2006; Hier & Eckert, 2014, 2016; Hier & Mahony, 2017; Koenig et al., 2016; Truckenmiller et al., 2014), the progress of students’ writing quality growth was assessed over time by calculating the total number of correct writing sequences (CWS) for each CBM-WE probe. CWS was used to provide an indication of students’ writing quality. Shapiro (2004) outlined scoring procedures for CWS for which all sequences are calculated by analyzing the correctness of all adjoining words in terms of spelling, syntax, punctuation, and capitalization. More specifically, CWS can be calculated by circling all of the words in the student’s writing sample that are spelled incorrectly, placing a caret (^) between each unit pair that are syntactically, mechanically, and semantically correct, then totaling the number of carets in the writing sample.

Total Words Written (TWW)

The number of total words written (TWW) for each student’s CBM-WE probe was calculated as a measure of writing quantity by counting the total number of letter clusters separated by a space, where all letter clusters were counted in the total regardless of spelling. The researchers underlined in pencil or pen words that were produced in the student’s WE-CBM writing sample. A word is identified as “any letter or group of letters separated by a space is defined as a word, even if the word is misspelled or a nonsense word” (Powell-Smith & Shinn, 2004). These calculations were also provided to the students on their individualized performance feedback forms. TWW metrics provide an indication of students’ writing fluency compared to grade level norms. For example, research suggests that the instructional level for a third-grade student is 37-40 TWW within 3 minutes (Shapiro, 2004).
**Kids Intervention Profile (KIP)**

Following the final intervention session, a modified version of The Kids Intervention Profile (KIP; Eckert et al. 2017; see Appendix F) was administered to evaluate students’ acceptability of the virtual intervention procedures. Students were asked to respond to 8 items about the virtual intervention using a 5-point Likert-type scale where higher scores represent greater acceptability. Within two previous studies conducted with third-grade students, this particular measure demonstrated acceptable internal consistency (Hier and Eckert 2014, 2016).

**Research Design**

A single-subject multiple-baseline across participants design (Kazdin, 2011) was used to evaluate the effectiveness of the performance feedback intervention through an online format (i.e., Zoom Communications Inc.) for students through the standards set for high quality single-case experimental design according to the What Works Clearinghouse standards (Kratochwill et al., 2020). Students’ writing fluency growth was measured by CWS on the CBM-WE probes and Total Words Written (TWW) to assess the effectiveness of the performance feedback intervention through an online format. This design included a baseline phase prior to the intervention phase, where students entered the intervention phase by either: (a) acquiring a data point equal to or below that of the previous three datums, or (b) exhibited a steady or declining trend in their baseline data. Data were visually inspected (i.e., level, trend, variability) within and across phases to assess immediate intervention effects (Gast, 2010). Both the level of stability in students’ performance (i.e., calculation of SD; Mason & Schriner, 2008) and percentage of non-overlapping of all pairs (NAP) were employed to supplement visual inspection (Scruggs et al., 1987).
This study was conducted in three phases: (1) a baseline phase, (2) an intervention phase, and (3) a maintenance phase. All the sessions were conducted individually via Zoom, and baseline and intervention sessions were conducted by intervention agents three times per week. Additionally, prior to implementation of the study, an intervention instruction sheet for the weekly intervention was emailed to the school resource teacher and the researchers held an individual meeting to go over the instruction sheet (see Appendix G) and the study procedures.

**Baseline Phase**

To begin, within the same time period, all three students entered the baseline assessment phase where in-person they were administered five CBM-WE probes for the researchers to acquire a baseline estimate of the students’ writing skills. All CBM-WE procedures were physically given to the resource teacher one hour prior to the scheduled intervention time. Following the end of the weekly scheduled session, the resource teacher provided the student’s CBM-WE probes to the intervention agent directly. All procedures were delivered in accordance with the What Works Clearinghouse Reviewer Standards (2020) for multiple-baseline single-case designs, where both the baseline and intervention phase contained at least five data points for all three participants. Following the administration of five CBM-WE probes during the baseline phase, student Alanisse entered the performance feedback intervention phase, while Carly and James remained in the baseline assessment phase.

**Intervention Phase**

Following the baseline phase, the intervention phase began. This phase was introduced to one student at a time while the other students remained in the baseline phase. It is important to note that all procedures took place via Zoom. During this phase, one hour prior to the weekly
scheduled meeting time, each student individually received a packet which a CBM-WE probe and individualized performance feedback from the resource teacher. Upon logging onto the weekly scheduled meeting, the resource teacher placed the individualized packet in front of the student. To provide instructions to the students throughout the intervention sessions, the intervention agents followed a procedural script for which they spoke through the microphone on their computer, along with sharing their computer screen where a PowerPoint that mirrored their individualized packet was displayed.

The following information represents the contents of students’ intervention packets: (page 1) the student’s identifying information, (page 2) the student’s individual performance feedback derived from the previous writing session, (page 3) a planning page with a story starter, and (page 4) a CBM-WE probe (i.e., a story starter with writing lines; Appendix H). The student’s individual performance page (page 2) consisted of a box that contained the total number of words the student wrote during the previous session, and an adjacent arrow that pointed up or down, indicating if their performance had improved or declined.

While logged into Zoom, both the student and the intervention agent had their microphone and video camera on (as stated in the intervention instruction sheet). Additionally, the intervention agent’s computer screen was shared with the student, to show a PowerPoint that mirrored the student’s packet. While speaking into the computer microphone, the intervention agent explained to the student that all the words they wrote the previous week had been counted and that number was reflected in the box (i.e., total words written) on their page. Students were told that if they saw an upward arrow, that meant they wrote more words than the previous week, a downward arrow indicated they wrote fewer words than the previous week, and an equal sign indicated that they wrote the same number of words in comparison to the previous week. Both
the number and arrow were written with a blue felt tip pen and highlighted with a neon pink highlighter.

When the student completed the first intervention session, the number provided to them in the box indicated the number of words they wrote during the baseline phase (i.e., the CBM-WE probe from the prior week). After the intervention agents reviewed page 2 of the packet that contained the individualized performance feedback, students turned to page 3 of the packet and were instructed to plan their writing for 1.5 minutes, then students completed the last step of the intervention session, a CBM-WE probe on page 4. This page consisted of a story starter, where students then wrote a story based on that story starter for a total of 4 minutes. At the end of each session, prior to logging off Zoom, students turned in their writing packet to their resource teacher. The Zoom meeting was then ended by the intervention agent when the resource teacher verbally confirmed that they had received the writing packet. During the last intervention session, the student was administered the KIP to assess student acceptability. The same procedures were followed as all the previous intervention sessions; however, the individualized packet contained the KIP survey at the end. The intervention agent read the questions aloud to the student as they marked their responses.

**Maintenance Phase**

Two weeks following the final intervention session, to assess for maintenance effects, the students were given an individualized writing packet by the resource teacher that were identical to the intervention sessions. The only difference within the individualized packets, was that the PF portion of the packet was not present, where the individualized packets contained the students’ cover page (name and grade), a planning page (1.5 minutes to plan), and a CBM-WE probe (story starter with 4 minutes to write). All maintenance sessions were conducted in person.
**Reinforcement Procedures**

Within the current study, to reinforce students’ participation during the intervention sessions, a positive reinforcement system was added to the intervention procedures. Specifically, as the participants were eligible for special education services and work on a weekly basis with the resource teacher, the reward system that was utilized within that environment was adapted. Prior to the intervention sessions beginning, the resource teacher refreshed the treasure chest prize box with items pertaining to the participants’ unique interests (Legos, Hot Wheels cars, fidgets, etc.). On a weekly basis, upon the last writing session for that week, participants were reinforced for their participation within the study, not on the improvement of their written expression by means of visits to the reward treasure chest.

**Procedural Integrity**

A procedural integrity checklist was completed by a secondary intervention agent for 20% \((n = 4)\) of sessions across students and phases to evaluate the extent to which the study procedures were conducted with fidelity. For these sessions, the secondary intervention agent logged onto the weekly scheduled intervention meetings but kept their video and audio muted. Throughout these sessions, the secondary intervention agent was provided with an identical script to that of the primary intervention agent, in which they were responsible for identifying step-by-step whether the procedural script was implemented accurately. If a step was implemented appropriately, the secondary intervention agent would give credit for that step by placing a checkmark on the script next to the step completed. Procedural integrity was calculated by summing the total number of occasions (i.e., checkmarks) in which the primary intervention agent accurately implemented the intervention, dividing that number by the total number of
possible steps, and multiplying that number by 100%. Upon completion, results indicated that 100% of steps were implemented with fidelity.

**Interscorer Agreement**

For interscorer agreement calculations, a random selection of 25% of the CBM-WE probes was selected and re-scored by a second experimenter who had been trained in CBM scoring procedures. To calculate interscorer agreement, the sum of agreements and disagreements was divided by the total number of agreements. Results indicated that the mean interscorer agreement was 100% for TWW, and 100% for CWS.

**Data Analysis**

**Visual Analysis**

Visual analysis is frequently used by researchers to analyze the results of single-subject research. Throughout the process of visual analysis of graphed data, behavioral changes across and within phases were examined. When examining data within phases, the following factors were taken into consideration: total number of data points within the phase, variability in performance, level of behavior, and trend in data.

Richards et al. (1999) noted that there is a crucial number of data points within a phase that represents performance on the dependent variable. First, to determine the number of necessary data points, the nature of the variable being measured (i.e., CWS) was considered, noting that fewer data points are necessary when the variable is less likely to change without a phase change. Additionally, when considering performance, it was noted that more data points would be necessary in order to draw conclusions if the student demonstrated greater fluctuation in performance. Finally, the trend of the data was visually analyzed (i.e., the direction of the path
of the plotted data) by determining if the data were increasing, decreasing, flat, variable, or stable.

In addition to visual analysis within phases, visual analysis across phases was conducted to allow for greater interpretation of the relationship between the independent and dependent variables. When the graphed data was analyzed, the immediate change in level was considered, across phases, and trend. A strong functional relationship would be noted between variables if there was an immediate change in level following a phase change (i.e., the intervention had an impact on the student’s behavior). Additionally, if there was a steady change over a number of data points, a potential behavioral change was noted, despite the absence of an initial jump.

Lastly, non-overlapping of all pairs (NAP) between baseline and intervention phases were visually analyzed for each participant. When data does not overlap across phases, we can suggest that the behavioral change (i.e., increase in CWS) is a result of the independent variable (i.e., performance feedback intervention; Richards et al., 1999).

**Quantitative Analyses**

Two methods were utilized to calculate effect size, within-case standard mean difference (WC-SMD; Busk & Serlin, 1992; Pustejovsky et al., 2021) and non-overlap of all pairs (NAP). WC-SMD was calculated to report the change in participants’ performance between the baseline and intervention phase in context to the variability of their own data. This was achieved by utilizing the formula $WC - SMD = \frac{\mu_B - \mu_A}{\sigma_p}$ with the following representations: $\mu_B$: the intervention phase mean performance, $\mu_A$: the baseline phase mean performance, and $\sigma_p$: pooled standard deviation between both phases. Furthermore, to report the ratio of improved to nonimproved data points for the participants, the calculation of non-overlap of all pairs (NAP) was calculated. The formula equation $NAP = \frac{Pos + (0.5 \times \text{# of Ties})}{Total \ # \ of \ pairs}$ was utilized to calculate NAP
between the baseline and intervention phases for each participant, with the following representations: *Pos*: the number of times an intervention data point improved upon comparison to the baseline point, *Ties*: total number of times an intervention point was equivalent to a baseline point, and *pairs*: total number of baseline-to-intervention pairs of data points (Parker & Vannest, 2009).

**Research Questions and Hypotheses**

*Research Question 1*: Does the performance feedback writing intervention provided via an online format increase the writing fluency of three students with disabilities as measured by total words written (TWW)?

*Hypothesis 1*: The performance feedback writing intervention provided via an online format will increase the writing fluency of three students with disabilities as measured by total words written (TWW).

*Research Question 2*: Does the performance feedback writing intervention provided via an online format increase the writing quality of three students with disabilities as measured by correct written sequences (CWS)?

*Hypothesis 2*: The performance feedback writing intervention provided via an online format will increase the writing quality of three students with disabilities as measured by correct written sequences (CWS).

*Research Question 3*: Do students with disabilities find the performance feedback writing intervention provided via an online format socially acceptable?

*Hypothesis 3*: Students with disabilities will find the performance feedback writing intervention provided via an online format to be socially acceptable.
Chapter IV

Results

TWW means across participants and phases are provided in Table 1 and CWS means across participants and phases are provided in Table 2. These results were contextualized using available Aimsweb CBM-WE writing fluency performance norms (2015). However, Aimsweb CBM-WE procedures provide 1-minute to think/plan and 3-minutes to write. In the current study, in accordance with prior performance feedback literature (and district practice), students were given 1.5 minutes to think/plan and 4-minutes to write. Therefore, in order to make the current data comparable to Aimsweb norms, the Aimsweb norms were adjusted by multiplying each normative data value by 1.33. This was done as a means of adjusting the 3-minute allotted (Aimsweb) time upward in a proportional manner to the allotted time provided in the present procedures. As students were in the second and third grades and data was collected in the winter term, winter second-and third grade TWW and CWS Aimsweb norms were adjusted. Please see Table 3 for original and adjusted Aimsweb norms at the 10th, 25th, 50th, 75th, and 90th percentiles.

Visual and Quantitative Analyses

Alanisse

Alanisse’s mean baseline TWW was 28.8, between the 10th and 25th percentile for adjusted Winter third grade TWW norms (see Table 1). Her average performance for TWW during the intervention phase was 49.4 (between the 50th and 75th adjusted percentiles), and she continued to make gains after the intervention phase ceased, as she wrote 66 TWW within the maintenance phase (75th - 90th adjusted percentile range). Visual analysis of Figure 3 shows a relatively stable baseline, with ranges from 23-32 TWW. When Alanisse was introduced to the intervention, her performance immediately increased and only fell 7.5 TWW below the Aimsweb
(2015) adjusted writing fluency norms at the Winter TWW 75th percentile (51 TWW).
Immediately following that data point, Alanisse’s next data point fell just above the adjusted Winter TWW 10th percentile norm (23 TWW). However, following that intervention session, Alanisse’s remaining eleven data point surpassed the adjusted Winter 25th to 75th percentile TWW norms, ranging from 39 to 66 TWW. Alanisse maintained her writing growth after the removal of the intervention, with 66 TWW occurring two weeks after the final intervention session.

Mean CWS performance across participants and conditions are displayed in Table 2. Alanisse’s mean baseline CWS was 18.8, just below the 25th percentile for the adjusted third grade Winter CWS. Her average performance for CWS during the intervention phase was, 32.6, and she continued to make gains after the intervention phase was extracted, as she wrote 39 CWS within the maintenance phase. Visual analysis of Figure 4 shows a relatively fluctuating baseline, with ranges from 12-26 CWS. When Alanisse was introduced to the intervention, her performance immediately increased and surpassed the adjusted Aimsweb (2015) writing fluency norms at the Winter CWS 50th percentile (38 CWS). Immediately following that data point, Alanisse’s next data point fell just below the adjusted Winter CWS 25th percentile norm (19 CWS). Following that intervention session, Alanisse’s remaining eleven data points fluctuated, ranging from 24-45 CWS. Alanisse maintained her writing quality growth after the removal of the intervention, with 39 CWS occurring two weeks after the final intervention session.

Table 4 reports all effect size metrics for all student participants. To estimate effect sizes, both within-case standard mean difference (WE-SMD) and nonoverlap of pairs (NAP) were calculated. Parker and Vannest (2014) provided the following suggestions for interpreting NAP scores within single-subject designs: .93-.0 = large effects, .66-.92 = medium effects, and 0-.65
= weak effects. Regarding interpreting WC-SMD, although no true consensus exists, 2.0 is generally considered a large effect size (Barton et. al, 2017). Alanisse’s TWW WC-SMD was 3.02 (large) and NAP was 0.92 (medium-large). Alanisse’s CWS WC-SMD was 2.03 (large) and NAP was 0.92 (medium-large).

James

James’s mean baseline TWW performance was 36.9 (between the 50th and 75th percentile for second grade adjusted norms). His average performance for TWW during the intervention phase was 70.9 (above the 90th percentile for second grade adjusted norms). James’s performance remained the same after the removal of the intervention, as he wrote 70 TWW. Visual analysis of Figure 3 shows a relatively increasing baseline, with one significant outlier during session four for James, with baseline data ranging from 10-45 TWW. When the intervention was introduced to James, his performance immediately increased and surpassed the Aimsweb Winter adjusted second grade TWW writing fluency norms at the 90th percentile (90th percentile adjusted norm = 55.9 TWW). James reached his highest performance on the final intervention session (76 TWW).

James’s mean baseline CWS was 30, just below the 75th percentile for the adjusted second grade Winter CWS norms. His average performance for CWS during the intervention phase was 56.6, and he maintained his gains after the intervention phase stopped, as he wrote 58 CWS within the maintenance phase. Both of these performances exceed the adjusted norm at the 90th percentile for second-grade Winter CWS performance. Visual analysis of Figure 4 shows a relatively fluctuating baseline, with ranges from 10-44 CWS. When James was introduced to the intervention, his performance immediately increased and surpassed the Aimsweb writing adjusted norms at the Winter TWW 90th percentile (47.9 CWS). Immediately following that data
point, James’s next data point was 60 CWS. Following that intervention session, James’s remaining six data point remained relatively stable, ranging from 53-60 CWS, consistently above the Winter adjusted CWS 90th percentile norm of 47.9. James maintained his writing quality growth after the removal of the intervention, with 58 CWS occurring two weeks after the final intervention session.

Quantitative analyses for James are reported in Table 4. His TWW WC-SMD was 2.29 and NAP was 1.0, which indicates no overlapping data between the baseline and intervention phases and large treatment effects. His CWS WC-SMD was 2.13 and NAP was 1.00, which indicates no overlapping data between the baseline and intervention phases and large treatment effects.

**Carly**

Carly’s mean baseline TWW performance was 49.6, surpassing the third-grade Winter TWW 50th percentile adjusted norm of 45.2. In the intervention phase, her mean performance was 65 TWW, while her maintenance phase performance was 65 TWW (75th - 90th percentile adjusted norm range). Visual analysis of Figure 3 shows variability in Carly’s baseline data, with relative stability across the first three points (45, 60, and 48 TWW), and then a significant dip to 11 TWW in the fourth baseline session, with the subsequent ten data points varying from 31 to 68 TWW.

Carly’s mean baseline CWS was 7.3, falling below the 10th percentile for third grade Winter TWW adjusted norms. Her average performance for CWS during the intervention phase was 10.8; and her performance during the maintenance phase was 12 CWS. Visual analysis of Figure 4 shows a relatively fluctuating baseline, with ranges from 0-14 CWS. When the intervention was introduced to Carly, her performance remained relatively stable initially at 7
CWS. Immediately following that data point, Carly’s next data point increased to 9 CWS, however, still falling below the 10th percentile for third grade Winter CWS adjusted norms. After that intervention session, Carly’s remaining three data point fluctuated, ranging from 6-21 CWS, below the 50th percentile Winter TWW adjusted norms of 32.

Carly’s quantitative analyses are reported in Table 4. Her TWW WC-SMD was 0.91 and NAP was 0.87, indicating moderate effect sizes. Her CWS WC-SMD was 0.75 and NAP was 0.69, also indicating moderate effect sizes.

**Intervention Acceptability**

After the final intervention sessions, participants’ acceptability data were gathered via the KIP. Two students indicated that they liked writing stories with us each week “very, very much”, with the other student indicating “a lot.” Two students indicated that they liked being told “a little bit” about what to write, while the other student indicated “some.” Two students indicated that there were “never” times that they did not want to write a story with us, while the other student indicated “sometimes.” All three students indicated that they wished they could work more on writing stories with us “very, very much.” Two students indicated that they liked being told how many words they wrote “very, very much,” while the other student indicated “a lot.” All three students indicated that they think the intervention helped them when they were told how many words they wrote and that their writing has improved, “very, very much.” When asked if they think their writing has gotten worse, all three students indicated “not at all.”
Chapter V

Discussion

This study builds on current literature that has aimed to understand various conditions where the PF intervention has been implemented to successfully increase the writing fluency of general education students in in-person, class-wide settings. Compared to previous investigations, this study is unique in that the PF intervention was implemented completely remotely via Zoom Inc., due to the COVID-19 pandemic. The present study contrasted with previous PF intervention studies in four primary ways: (1) use of a virtual platform to deliver all procedures in one-on-one sessions with interventionists, (2) use of a visual aid (i.e., PowerPoint) to deliver procedures rather than paper-and-pencil materials, (3) the exclusive recruitment and participation of students with disabilities, and (4) use of reinforcement delivered contingent upon participation in study procedures.

Firstly, with the assistance of the resource teacher, through the virtual platform (i.e., Zoom Inc.), PF intervention features were exclusively implemented remotely in one-on-one sessions with the interventionist. Secondly, during remote sessions, each student’s individualized PF intervention packet was created in PowerPoint and presented using the slide-share feature of the virtual platform on the student’s computer screen. Thirdly, to further understand if this PF intervention can work with students with disabilities, this study included three elementary-school students with IEPs for autism, speech/language impairment, and/or ADHD. This population has typically been excluded from data sets analyzed in previous studies and the present researchers were interested in investigating PF intervention effects with this student group. Lastly, a treasure chest prize box reinforcement procedure was added to promote participation with intervention procedures.
To determine intervention effects, the primary method of analysis used was visual analysis, as is the gold standard in single-subject design. Following, quantitative analyses were used as supplemental analyses, as they allow the ability to detect minor but significant changes in data, particularly when changes are not obvious (Schäfer & Schwarz, 2019).

Visual analysis revealed that Alanisse’s writing fluency (TWW) increased during the intervention phase and gains were sustained during the maintenance phase, with the calculated NAP value (0.92; medium/large treatment effect) further supporting an improvement in Alanisse’s writing fluency, with only one data point overlapping between the baseline and intervention phases. Secondly, visual analysis of Alanisse’s writing quality (CWS) revealed improvements during the intervention phase that were sustained during the maintenance phase, with a calculated NAP value (0.92; medium/large treatment effect) also supporting an increase in writing quality. Lastly, further statistical analysis of Alanisse’s writing fluency data revealed a very large effect size of WC-SMD = 3.02, and a large treatment effect for writing quality (WC-SMD = 2.03), bolstering the confidence with which researchers can claim PF intervention effectiveness for Alanisse. Visual analysis revealed that James’s writing fluency (TWW) increased during the intervention phase and remained high during the maintenance phase, with large effect sizes (NAP =1.0; WC-SMD = 2.29) further supporting the effectiveness of the intervention for writing quantity. Secondly, visual analysis of James’s writing quality (CWS) revealed an increase during the intervention phase that was sustained during the maintenance phase, also with large effect sizes (NAP =1.0; WE-SMD = 2.13) further supporting the effectiveness of the intervention for writing quality.

Visual analysis revealed that Carly’s writing fluency (TWW) increased during the intervention phase and remained high during the maintenance phase. Whereas her TWW
baseline data path was marked by a great deal of variability, her intervention phase data leveled off and was remarkably stable. Effect sizes were moderate for Carly’s writing fluency (NAP = .87 and WC-SMD = .91). Visual analysis of Carly’s writing quality (CWS) revealed an increase during the intervention phase and a slight decrease during the maintenance phase, with moderate effect sizes (NAP = .69, WC-SMD = .75).

Visual and quantitative analyses revealed that all three students made gains, thus demonstrating that PF procedures could be delivered via one-on-one remote sessions with positive effects across three elementary students with disabilities. Further discussion of the students’ gains is presented below.

Alanisse began the study between the 10th and 25th percentile for TWW and below the 25th percentile for CWS. Across the intervention phase, her TWW performance improved and surpassed the 75th percentile range for Winter TWW national adjusted norms for her grade-level and surpassed the 50th percentile for CWS. This indicates that her writing fluency improved, as calculated by counting the total number of letter clusters offset by spaces, where all letter clusters were counted in the total regardless of spelling correctness (TWW). She also met grade-level expectations in terms of CWS (a metric that considers spelling, syntax, punctuation, and capitalization). Although both Alanisse’s writing quantity and quality metrics improved, her TWW (the measure of writing quantity) improved to a greater degree with the implementation of PF.

James began the study with both TWW and CWS baseline performance between the 50th and 75th percentile. Across the intervention phase, both his TWW and CWS performance improved and surpassed the 90th percentiles for national adjusted grade-level norms. This
indicates that James’s writing fluency and writing quality measures exceeded second grade-level expectations by the study’s conclusion.

Carly began the study between the 50th and 75th percentile for TWW and below the 10th percentile for CWS. This indicates that she was writing a sufficient number of words (or clusters of letters) for her grade level but making many errors in spelling, syntax, punctuation, and/or capitalization). Across the intervention phase, her TWW performance improved and approached the 90th percentile range for Winter TWW national adjusted norms, but her CWS only improved to the 10th percentile. This indicates that although her writing fluency (TWW) substantially improved, she continued to fall below grade-level expectations in terms of writing quality (CWS). This means that even though she wrote more ‘words’ following the intervention, it seems that the quality of the ‘words’ she wrote continued to not meet grade-level expectations.

**Implications of the Findings**

All three students entered the study at different writing skill levels. Regarding TWW, Alanisse began the study with lower TWW (28.8) than James (36.9) and Carly (49.6). However, all three students improved their TWW across the study. Regarding CWS, two students entered the study with low CWS, Alanisse (18.8) and Carly (7.3), whereas James entered the study with 30 CWS, despite him being in second grade and the other two participants in third grade. Throughout the study, Alanisse and James made significant CWS gains, while Carly did not. Important to note is that although each of the participants entered the study at different levels of writing performance (quality and quantity), the intervention resulted in improvement for each individual to varying degrees. These results have implications for students with all types of skill levels and types of disabilities for the improvement of writing fluency and written expression.
quality, suggesting that students of varying skill levels can improve their written expression outcomes with the implementation of the PF intervention.

Through the PF intervention implementation, for two of the three students (Alanisse and Carly), this study worked better for improving writing fluency (TWW) than writing quality (CWS). In PF intervention procedures, students are only provided with feedback regarding the number of words they wrote from the previous writing session, not regarding any aspects of their writing quality. Due to this, the students may have been motivated to write more words in total, while not paying attention to their quality of writing (e.g., spelling, grammar, syntax) or editing processes. Additionally, no writing instruction was provided as part of the PF intervention procedures. Readers should be reminded that the students in the study were chosen for participation because they were identified as struggling with their overall written expression and were participating in special education services with specially designed instruction through IEPs. Future research may utilize the performance feedback intervention as a screener to identify if a performance intervention rather than a skill building intervention is most appropriate for the student’s written expression needs. This would allow for researchers to further individualize the intervention for the student based on their academic needs and allow them to master that writing step before moving into the next (e.g., moving from writing fluently to the planning stages of writing).

An exception to this outcome was James. James improved both in writing fluency (TWW) and quality (CWS) across these procedures. One potential reason for this pattern of results concerns the educational diagnoses of the participants. James has an educational diagnosis of Autism, and his IEP focuses primarily on improving social/emotional functioning, whereas the other two participants have diagnoses of ADHD, with stronger academic goals in
their IEPs. Given these diagnoses, attention-related variables may have had an impact on the results. Thus, perhaps the PF intervention might lead to both increased quantity and quality of writing for students who have been found eligible for special education services under the category of Autism, for students with less academic-related goals in their IEPs, or for students with higher developed writing skills. Moreover, the PF intervention may work well for students to get words onto paper (e.g., writing fluency), however, it is unclear if it improves the quality of what the students write. As CWS have been identified to be too complex in nature to provide feedback on to elementary-aged students, future research may incorporate a different format of measuring students’ writing quality, such as the utilization of a writing quality rubric.

Students who are identified to be struggling with written expression may require direct instruction, explicit feedback on their writing performance, and various interventions may need to be tailored to help foster the organization of their writing. Thus, the PF intervention may be better for targeting students with “won’t do” writing problems rather than students with “can’t do” writing problems. For example, both Alanisse and Carly received written expression interventions via their IEPs, where they have been identified to need specially designed instruction within this curricular area and could be identified as a student with “can’t do” writing problems. Whereas James did not have academically based goals on his IEP, where he could be identified as students with a “can’t do” writing deficit. For Alanisse and Carly, we could expect to see an increase in their TWW, but without a skill-based intervention, we cannot expect CWS to disproportionately increase. This is especially true when contextualized within a general education population versus special education population. It can be argued that typically developing students who are able to access the general education curriculum without the need for specially designed instruction and special education services through an IEP, may be able to
make writing gains that approximate or even exceed grade-level expectations. Students who require specially designed instruction and special education services, based on their current functioning, are given explicit academic goals to work towards on a yearly basis, where direct, explicit, interventions are implemented. Based on the eligibility category of the student and what their academic, social/emotional, or physical needs are, it can be argued that some of these students in fact may not reach grade-level written expression expectations without more intensive interventions. Furthermore, this performance feedback intervention may be applicable to students who have been identified with an emotional disability (ED) where their written expression struggles in the classroom may take shape more to a “won’t do” writing deficit rather than “can’t do.”

Relatedly, the PF intervention has only provided students with feedback on their TWW, regardless of the quality of the writing output. Researchers may consider exploring how changing the type of feedback offered may impact the results of the intervention. For example, correctly spelled words (CSW) may be utilized to help the improvement of overall writing quality which has been measured by CWS where spelling is taken into consideration. A development of such a study may allow for the improvement of writing performance of students with or without disabilities.

Relatedly, previous PF studies have mostly been conducted group-wide with general education students (Eckert et al., 2006; Hier & Eckert, 2014, 2016; Hier & Mahony, 2017; Koenig et al., 2016; Truckenmiller et al., 2014). In contrast, this study sought specifically to investigate the PF intervention’s efficacy with students with disabilities, as such, the intervention was tailored for use with these students. Specifically, the intervention was delivered in a one-on-one format so that students could be given individualized attention, ensuring student attention
was paid to the crucial feedback component of the procedures. Additionally, compared to the original PF format, where paper feedback packets containing feedback written in black pen or pencil were passed out to students in a large group format, in this study, feedback was written in bright blue marker and highlighted in neon pink. Feedback was delivered via screen-share during one-on-one virtual sessions. Furthermore, the researcher was able to redirect any off-task behavior as it occurred, compared to a full classroom of students in a group-wide format. Lastly, reinforcement procedures (i.e., the resource teacher allowing students to pick from the treasure chest prize box concluding the week’s writing sessions) were implemented, where a group-wide format has not utilized these before.

Ultimately, all three students deemed the virtual PF intervention to be socially acceptable. Such results reveal two important implications. First, students with disabilities found the PF intervention to be helpful, where all three students indicated that they thought the intervention helped them when they were told how many words they wrote and that their writing had improved. Next, all three students indicated that they wished they could work more on writing stories with the interventionist(s). The virtual implementation was deemed socially acceptable. Given that the PF is a simple, timely, and socially acceptable intervention, it has the potential to be self-managed, with no interventionist or teacher participation required at all. Future research may investigate the removal of the intervention agent and replace them with peers or develop PF procedures that are completely self-managed by student participants themselves. Relatedly, academic interventions via remote platforms have the potential to be helpful when a district is understaffed, and travel time may be a concern. For example, there could be a centrally stationed interventionist while they intervene with students at a variety of locations. Additionally, remote intervention can have applications to remote locations. For example, there may be a potential to
work with students with rare disabilities, where the remote intervention allows for this group of individuals to come together.

Limitations

First, standard assessment procedures were not used for the CBM-WE measures used in the current study, resulting in a lack of norms with which to interpret the data reliably. Researchers created adjusted TWW and CWS norms to further contextualize the present results; however, no data exists regarding the reliability and validity of these norms. Although a theoretical basis was used to support the rationale behind these norms’ creation (that student TWW and CWS increase proportionally over time during timed CBM-WE assessments), it is possible, for example, that students may do the majority of their writing in the first couple minutes of the assessment and spend the remaining time editing. In other words, students may not be gaining TWW and CWS in a linear fashion during CBM timed writing assessments. Therefore, the adjusted norms should be interpreted with caution. Future researchers should replicate this study using standard CBM-WE procedures so that reliable and valid norms can be used in interpretation of the results.

Second, regarding the two reported effect sizes for supplemental data analysis purposes, readers should interpret this information with caution. Single-subject researchers have historically failed to agree on a common metric for determining effect size, thus there is little consensus for what is considered to be a small, medium, or large effect size (Funder & Ozer, 2019). Third, when considering the substantial improvement of the students’ TWW, the results must be taken into consideration within the context of writing quality. Although all three students’ writing fluency did increase substantially, researchers may question whether increased writing quantity equates to improved writing quality. In the present study, we used CWS as our
measure of writing quality and two of our three participants improved substantially on this measure. However, is CWS an adequate measure of writing quality? Are there other dependent variables that reliably predict students’ writing quality that could be used in future PF studies to supplement TWW?

Lastly, the participation reinforcement procedures were not conducted in isolation from the PF procedures, thus it is impossible to know if the obtained results would have been observed had the PF intervention been implemented in the absence of the reinforcement procedures. Future researchers may wish to either a) replicate this study without the reinforcement procedures entirely, or b) consider including reinforcement procedures that are made contingent upon increased student writing performance (as opposed to contingent upon participation), thus potentially enhancing the effects of the PF intervention on performance over the present results.

Conclusion

This implementation of the PF intervention indicates initial support for this intervention via a fully remote format with elementary-school students with disabilities. As PF was initially designed for a group-wide format in an in-person general education setting, researchers aimed to fill a gap in the literature by conducting PF with students with disabilities. Given the COVID-19 health pandemic, the study also sought to examine the efficacy of the evidence-based PF intervention procedures via a fully remote platform. Additionally, the study added an additional reinforcement procedure to promote student participation in the study procedures.

Results of the study demonstrated that the PF intervention can be implemented successfully with students with disabilities via a fully virtual platform. Although all students’ writing fluency substantially increased throughout the intervention, only two of the three students’ writing quality substantially increased. All intervention effects were maintained
following the removal of the intervention and the three students found the intervention highly acceptable.

The implementation of the PF intervention using a remote platform allows interventionists to promote the writing fluency of students with an array of disabilities amidst the novel COVID-19 pandemic and beyond. These results contribute to the evolving world of virtual evidence-based academic interventions.


http://dx.doi.org.gate.lib.buffalo.edu/10.1007/BF01026911


http://dx.doi.org.gate.lib.buffalo.edu/10.1016/j.jsp.2005.12.003


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Table 1

Mean Total Words Written (TWW) Across Phases and Participants with Associated Adjusted Normative Percentile Ranges

<table>
<thead>
<tr>
<th></th>
<th>Baseline TWW</th>
<th>Normative Range*</th>
<th>Intervention TWW</th>
<th>Normative Range*</th>
<th>Maintenance TWW</th>
<th>Normative Range*</th>
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</thead>
<tbody>
<tr>
<td>Alanisse</td>
<td>28.8</td>
<td>10th – 25th</td>
<td>49.4</td>
<td>50th – 75th</td>
<td>66</td>
<td>75th – 90th</td>
</tr>
<tr>
<td>Carly</td>
<td>49.6</td>
<td>50th – 75th</td>
<td>65</td>
<td>75th – 90th</td>
<td>65</td>
<td>75th – 90th</td>
</tr>
<tr>
<td>James</td>
<td>36.9</td>
<td>50th – 75th</td>
<td>70.9</td>
<td>&gt; 90th</td>
<td>70</td>
<td>&gt; 90th</td>
</tr>
</tbody>
</table>

*Normative percentile ranges were taken from adjusted winter Aimsweb CBM-WE TWW norms – see Table 3.
Table 2

*Mean Correct Writing Sequences (CWS) Across Phases and Participants with Associated Adjusted Normative Percentile Ranges*

<table>
<thead>
<tr>
<th></th>
<th>Baseline CWS</th>
<th>Normative Range*</th>
<th>Intervention CWS</th>
<th>Normative Range*</th>
<th>Maintenance CWS</th>
<th>Normative Range*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alanisse</td>
<td>18.8</td>
<td>10&lt;sup&gt;th&lt;/sup&gt; – 25&lt;sup&gt;th&lt;/sup&gt;</td>
<td>32.6</td>
<td>50&lt;sup&gt;th&lt;/sup&gt; – 75&lt;sup&gt;th&lt;/sup&gt;</td>
<td>39</td>
<td>50&lt;sup&gt;th&lt;/sup&gt; – 75&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Carly</td>
<td>7.3</td>
<td>&lt; 10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>10.8</td>
<td>&lt; 10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>12</td>
<td>= 10&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>James</td>
<td>30</td>
<td>50&lt;sup&gt;th&lt;/sup&gt; – 75&lt;sup&gt;th&lt;/sup&gt;</td>
<td>56.6</td>
<td>&gt; 90&lt;sup&gt;th&lt;/sup&gt;</td>
<td>58</td>
<td>&gt; 90&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

*Note.* *Normative percentile ranges were taken from adjusted winter Aimsweb CBM-WE CWS norms – see Table 3.*
Table 3

*Original and Adjusted Aimsweb Curriculum-Based Measurement-Written Expression (CBM-WE) National Winter Norms for Total Words Written (TWW) and Correct Written Sequences (CWS)*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentile</th>
<th>TWW Original</th>
<th>TWW Adjusted</th>
<th>CWS Original</th>
<th>CWS Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>90&lt;sup&gt;th&lt;/sup&gt;</td>
<td>42</td>
<td>55.9</td>
<td>36</td>
<td>47.9</td>
</tr>
<tr>
<td></td>
<td>75&lt;sup&gt;th&lt;/sup&gt;</td>
<td>34</td>
<td>45.2</td>
<td>25</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td>50&lt;sup&gt;th&lt;/sup&gt;</td>
<td>25</td>
<td>33.3</td>
<td>16</td>
<td>21.3</td>
</tr>
<tr>
<td></td>
<td>25&lt;sup&gt;th&lt;/sup&gt;</td>
<td>18</td>
<td>23.9</td>
<td>9</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>11</td>
<td>14.6</td>
<td>5</td>
<td>6.7</td>
</tr>
<tr>
<td>3</td>
<td>90&lt;sup&gt;th&lt;/sup&gt;</td>
<td>53</td>
<td>70.5</td>
<td>48</td>
<td>63.8</td>
</tr>
<tr>
<td></td>
<td>75&lt;sup&gt;th&lt;/sup&gt;</td>
<td>44</td>
<td>58.5</td>
<td>35</td>
<td>46.6</td>
</tr>
<tr>
<td></td>
<td>50&lt;sup&gt;th&lt;/sup&gt;</td>
<td>34</td>
<td>45.2</td>
<td>24</td>
<td>31.9</td>
</tr>
<tr>
<td></td>
<td>25&lt;sup&gt;th&lt;/sup&gt;</td>
<td>25</td>
<td>33.3</td>
<td>15</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td>10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>17</td>
<td>22.6</td>
<td>9</td>
<td>12.0</td>
</tr>
</tbody>
</table>

*Note.* National normative data was taken from Aimsweb 2015/2016; Adjusted norms were calculated by multiplying each value by 1.33 because the present procedures allowed 1.33 more writing time than standard Aimsweb CBM-WE procedures.
Table 4

*Within-Case Standard Mean Difference (WE-SMD) and Non-Overlap of all Pairs (NAP) Effect Sizes Across Participants and Total Words Written (TWW) and Correct Written Sequences (CWS)*

<table>
<thead>
<tr>
<th>Participant</th>
<th>TWW</th>
<th></th>
<th>CWS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WC-SMD</td>
<td>NAP</td>
<td>WC-SMD</td>
<td>NAP</td>
</tr>
<tr>
<td>Alanisse</td>
<td>3.02**</td>
<td>.92*</td>
<td>2.03**</td>
<td>.92*</td>
</tr>
<tr>
<td>Carly</td>
<td>2.01</td>
<td>.87*</td>
<td>1.0**</td>
<td>1.0**</td>
</tr>
<tr>
<td>James</td>
<td>2.29**</td>
<td>1.0**</td>
<td>2.13**</td>
<td>1.0**</td>
</tr>
</tbody>
</table>

*Note. Suggestions for interpreting NAP scores: .93-1.0 = large effects**; .66-.92 medium effects*; 0-.65 weak effects (Parker & Vannest, 2014); No consensus exists regarding interpreting WC-SMD, although 2.0 or higher is generally considered a large effect** (Barton, Pustejovsky, Maggin, & Reichow, 2017).*
Figure 1

Hayes and Flower (1980) Model of Writing

Planning  Translating  Reviewing

Idea Generation  Organizing  Goal Setting  Evaluation  Revision
Figure 2

*Berninger and colleagues (1992) Component Processes of Writing*

Translating

- Text generation
- Transcription

Handwriting
- Spelling
- Fluency
Figure 3

Total Words per Written (TWW) Across Participants and Phases

- Alanis's TWW
- James's TWW
- Carly's TWW

Session
Figure 4

Correct Writing Sequences (CWS) Across Participants and Phases
List of Appendices

Appendix A: Procedural Script for Performance Feedback Intervention

Appendix B: Curriculum-Based Measurement in Written Expression (CBM-WE) Scoring Manual

Appendix C: Parent Consent

Appendix D: Student Assent

Appendix E: Complete List of Included Writing Prompts

Appendix F: Kids Intervention Profile (KIP) Packet

Appendix G: Resource Teacher Instructional Sheet

Appendix H: Student Writing Packet
Appendix A

Procedural Script – PF IX via Zoom Inc.

Directions: Please fill out each area detailed below. Please make sure that the identifying information (box 1) is complete before you submit the form.

I. Identifying Information

Name of Intervention Agent:

Name of Support Intervention Agent:

School / Classroom:

Date:

II. Data Collection – Material Preparation

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Two sharpened pencils</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>b.</td>
<td>Assessment packets</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>c.</td>
<td>Experimenter’s copy of packet</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>d.</td>
<td>One stopwatch</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes:

Absent students:

III. Data Collection Procedures

[Please check [✔️] each box as you complete each step]

✔

1. Gain the attention of the student by announcing (in a voice LOUD ENOUGH for the students to hear) that you are ready to begin.

   Once the student is paying attention, state to the student:

   “Hi (student’s name). If you have not already done so, please clean off the top of your desk, except for a pencil. Your teacher will be providing you with your packet. Please leave the packet closed until you are told to open them.”

2. Once you have visually confirmed that the student is ready to begin, state to the student:

   (Intervention Agent should begin screen sharing and share Slide 1 of the intervention PowerPoint) “Welcome. My name is _________ and I am a student at the Duquesne University. Today I want you to write another story. Before we do that, I want to tell you how you are doing with your writing skills. The last time you wrote a story with us, we took all of your stories back to Duquesne University and we counted up all of the words that each of you wrote in your stories. Please turn to the next page of your packet (along with sharing slide 2 of the intervention)
**PowerPoint**. This page has a funnel with some numbers going into it at the top of the page.”

The research assistant should visually scan the computer screen to make sure the student is on the correct page.

<table>
<thead>
<tr>
<th>3.</th>
<th>State to the students:</th>
</tr>
</thead>
<tbody>
<tr>
<td>“The box in the middle of the page tells you how many words you wrote in your last story. Next to the box you will see an arrow.</td>
<td></td>
</tr>
<tr>
<td><strong>If the arrow is pointing up towards the sky, that means you wrote more words since the last time we worked with you.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>If the arrow is pointing down towards the floor, that means you wrote less words since the last time we worked with you.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>If you have an equal sign instead of an arrow, that means you wrote the same number of words as you did the last time we worked with you.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Every week when we work with you, we are going to tell you how you are doing with your writing.”</strong></td>
<td></td>
</tr>
</tbody>
</table>

| 4. | The intervention agent should monitor the students for questions. MAKE SURE THE STUDENT DO NOT TURN TO THE NEXT PAGE WITH THE WRITING PROMPT YET. |

<table>
<thead>
<tr>
<th>5.</th>
<th>State to the student:</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Now I want you to write another story. I am going to read a sentence to you first, and then I want you to write a story about what happens next. You will have some time to think about the story you will write and then you will have some time to write it.”</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6.</th>
<th>State to the student:</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Please turn to the next page of your packet. This page has a thought bubble at the top of the page.” (Intervention Agent should move to Slide 3 of the Intervention PowerPoint)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7.</th>
<th>State to the student:</th>
</tr>
</thead>
</table>
| “For the next minute think about writing a story that begins with this sentence –  

  **One day, when I got home from school…**  

**Remember, take time to plan your story. A well-written story usually has a beginning, a middle, and an end. It also has characters that have names**
and perform certain actions. Use paragraphs to help organize your story. Correct punctuation and capitalization will make your story easier to read.

*Do not write the story yet. Just think of a story that begins with this sentence –*

**One day, when I got home from school…”**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>The intervention agent should begin the stopwatch and time the students for 1 minute. The intervention agent should scan the computer screen to make sure that all of the students are on the correct page and not writing their story. Writing on the planning page is acceptable.</td>
</tr>
<tr>
<td>9.</td>
<td>At 30 seconds, state to the student: “You should be thinking about <strong>One day, when I got home from school…</strong>”</td>
</tr>
<tr>
<td>10.</td>
<td>At the end of 1 minute, state to the student: “Okay, stop thinking. Turn to the next page of your packet and raise your pencil high in the air!” <em>(Intervention agent should turn to Slide 4 of the Intervention PowerPoint)</em></td>
</tr>
<tr>
<td>11.</td>
<td>The intervention agent should scan the computer screen to make sure the student is on the correct page with their pencil raised.</td>
</tr>
<tr>
<td>12.</td>
<td>State to the student: “When I tell you to start, please begin writing your story. If you don’t know how to spell a word, try and sound out the parts of the word as best as you can. If you make a mistake, do not erase it – just cross it out and keep writing. If you fill up the first page, please turn to the next page and keep writing. Do not stop writing until I tell you to. Do your best work.”</td>
</tr>
<tr>
<td>13.</td>
<td>State to the student: “Okay, you can start writing! Remember, don’t stop writing until I tell you to stop.”</td>
</tr>
<tr>
<td>14.</td>
<td>The intervention agent should begin the stopwatch and time the student for 3 minutes. Monitoring the computer screen to ensure the student is following the instructions.</td>
</tr>
</tbody>
</table>
Also monitor the student to make sure that they are not re-copying the story starter. If a student is re-copying the starter, state to the student, “You don’t need to copy the words that have been provided.”

*Prompt students to keep writing if they stop early.

<table>
<thead>
<tr>
<th>Step</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.</td>
<td>At 1 minute and 30 seconds, state to the student: “Remember, you should be writing about: One day, when I got home from school…”</td>
</tr>
<tr>
<td>16.</td>
<td>After 4 minutes have elapsed, state to the student: “Please stop writing and close your packet.” (Intervention Agent should turn to slide 5 of the Intervention PowerPoint)</td>
</tr>
<tr>
<td>17.</td>
<td>Ensure the student has stopped writing and prompt student to state to the resource teacher that they are done.</td>
</tr>
<tr>
<td>20.</td>
<td>The intervention agent verbally confirms to the resource teacher that they received the packet from the student.</td>
</tr>
<tr>
<td>21.</td>
<td>After step 20 is successfully complete, the intervention agent will end the Zoom meeting for all parties.</td>
</tr>
</tbody>
</table>

**Total number of steps completed:**
Appendix B

Curriculum-Based Measurement - Scoring

There are several options when scoring CBM-WE probes. Student writing samples may be scored according to the:

(1) number of total words written (TWW)
(2) number of correctly spelled words (CSW)
(3) number of writing units placed in correct sequence – correct writing sequences (CWS)

Scoring methods differ both in the amount of time that they require of the examiner and in the quality of the information that they provide about a student’s writing skills. Advantages and limitations of each scoring system are presented below.
1 – Total Words Written (TWW):
The examiner counts and records the total number of words written during the 3-minute writing probe. Calculating total words written is the quickest of scoring methods. A drawback, however, is that it yields only a rough estimate of writing fluency – that is, how quickly the student can put words on paper – without examining the accuracy of spelling, punctuation, and other writing conventions.

Rules:
a) Any grouping of letters separated by a space is counted.
b) Misspelled words are counted in the tally.
c) Numbers written in numeral form (e.g., 5, 17) are not counted.
d) The words “The End” are not counted.
e) If the student rewrites the story starter, these words are counted.
f) UNDERLINE each total word written when scoring.

A CBM-WE sample scored for total words written is provided below:

Using the total words scoring formula, this sample is found to contain 45 words (including misspellings).

I woud drink water from the ocean . . . . 07
and I woud eat the fruit off of . . . . . . . . . 08
the trees. Then I woud bilit a . . . . . . . . 07
house out of trees, and I woud . . . . . . . . 07
gather firewood to stay warm. I . . . . . . . . 06
woud try and fix my boat in my . . . . . . . . . 08
spare time. . . . . . . . . . . . . . . . . . . . . . . . . . . . . 02
2 – Words Spelled Correctly (WSC):
The examiner counts up and records only those words in the writing sample that are spelled correctly. Words are considered separately, not within the context of a sentence. Assessing the number of correctly spelled words has the advantage of being quick. Also, by examining the accuracy of the student’s spelling, this approach monitors to some degree a student’s mastery of written language.

Rules/Considerations:
a) When scoring a word according to this approach, a good guideline is to determine whether, in isolation, the word represents a correctly spelled term in English. If it does, the word is included in the tally.

b) For contractions, proper use of apostrophes is ignored. For example, in the sentence, “That isn’t a red car,” 5 correctly spelled words would be recorded.

c) Assume all names of people are correctly spelled.

d) CIRCLE incorrectly spelled words.

A CBM-WE sample scored for correctly spelled words and total words written is provided below:

This sample is found to contain 39 correctly spelled words and 45 total words written.
3 – Correct Writing Sequences (CWS):

When scoring correct writing sequences, the examiner goes beyond the confines of the isolated word to consider units of writing and their relation to one another. Using this approach, the examiner starts at the beginning of the writing sample and looks at each successive pair of writing units (writing sequence). Words are considered separate writing units, as are essential marks of punctuation. To receive credit, writing sequences must be correctly spelled, and be grammatically correct. Each sequence should be examined in isolation and credit should be given when the sequence is correct (e.g., “seen the”) or marked incorrect when the sequence is not correct (e.g., “could seen”). In effect, the student’s writing is judged according to the standards of informal standard American English. A caret (^) is used to mark the presence of a correct writing sequence.

An illustration of selected scoring rules for correct writing sequences is provided below:

Because the period is considered essential punctuation, it is joined with the words before and after it to make 2 correct writing sequences.

Since the first word is correct it is marked sequences. as a correct writing sequence.

could be seen the trees of

^the^forrest^.

Grammatical or syntactical errors are not counted.

Misspelled words are not counted.
3 – Correct Writing Sequences (CWS):

Rules:

☑ Correctly spelled words make up a correct writing sequence (reversed letters are acceptable, so long as they do not lead to misspellings):

Example: ^I^like^the^reb^car^.

☑ Necessary end marks of punctuation (periods, question marks, and exclamation points are included in correct writing sequences:

Example: ^Is^that^a^red^car^?

All other punctuation, except apostrophes, that is used correctly is counted as well (quotation marks, colons, semicolons, parentheses).

Example: ^Sally said^,^^"^Is^that^a^red^car^?^^"

If commas or other punctuation besides the end punctuation is missing, students are not penalized for this.

☑ Syntactically correct words make up a correct writing sequence:

Example: ^Is^that^a^red^car^?

^Is^that^a^car^red^? [note: ‘car read’ is not syntactically correct]

☑ Semantically correct words make up a correct writing sequence:

Example: ^Is^that^a^red^car^?

^Is^that^a^read^car^? [note: ‘read car’ is not semantically correct]

☑ If correct and capitalized, the initial word of a writing sample is counted as a correct writing sequence:

Example: ^Is^that^a^red^car^?
Capitalization Rule: Only those words that begin a sentence and the word “I” are expected to be capitalized. Do not penalize other capitalization mistakes.

Example: ^Is^that^a^Red^ford^car^?
3 – Correct Writing Sequences (CWS):

Rules:

☐ Titles are included in the correct writing sequence count, but not the words “The End”:

Example: ^The^Terrible^Rotten^Day

☐ For this measure, numerals are counted.

Example: ^The^14^soldiers^waited^in^the^cold^.

^The^crash^occurred^in^1976^.

Rules:

Not surprisingly, evaluating a writing probe according to correct writing sequences is the most time-consuming of the scoring methods presented here. It is also the metric; however, that yields the most comprehensive information about a student’s writing competencies. A CBM-WE sample scored for correct writing sequences is provided below:

```
^I^would^drink^water^from^the^ocean . . 05
   . .
   ^and^I^would^eat^the^fruit^off^o
   f . . . .
^the^trees^. ^Then^I^would^hilt^a . . . . 05
   .
   ^house^out^of^trees. 06
^and^I^would . . . .
^gather^firewood^to^stay^warm^.^I . . . . 06
   .
   ^would^try^and^fix^my^boat^in^m . . . .
   ^spare^time^......................... . 03
```

This sample is found to contain **37 correct writing sequences**, **39 correctly spelled words**, and **45 total words written**.
GENERAL SCORING NOTES

1) Beginning sentences with conjunctions such as ‘and’ & ‘because’ is acceptable.
2) Letter reversals (i.e., writing a letter backwards) should not be penalized.
3) Words that represent sounds (e.g., mmmmm) or create new nouns or names (e.g., a new animal called a catbit) should be counted as correct.
4) If the story ends mid-sentence, this is ok, count correct writing sequences up until the last writing unit but do not count a sequence following the last writing unit.
   Example: ^A^red^car

Capitalization
1. ONLY count capitalization as incorrect if capitalization is missing
   a. For the word “I”
      Example: ^Please^keep^in^mind^that^i^don’t^like^you^.
   b. Proper names, like Jen, Florida, Santa Claus, Tooth Fairy
      Example: ^Each^year^he^starts^to^talk^about^santa^claus
      ^and^his^travels^across^the^world^.
   c. First word of sentence
      Example: ^my^dog^ran^away^.
2. If you can’t distinguish these letters (‘c’, ‘w’, ‘m’, ‘o’, ‘s’, ‘u’, ‘v’, ‘z’) as upper or lower case at the beginning of a sentence, mark it as correct.
3. If a word is capitalized that should not be, just continue scoring like it’s correct.
   Example: ^My^Mom^likes^it^too^.

Spelling
1. If a letter is reversed, it is still considered a correctly spelled word (e.g., I bon’t like writing).
**Hyphens**
1. Count a hyphenated word as ONE word (even if it is located in the middle of the sentence).
2. Count the hyphenated word as ONE correctly spelled word (even if it is located in the middle of the sentence).

**Numerals**
1. Count numerals (i.e., 365) as ONE unit.
2. Do not penalize for a lack of commas.
3. Do not provide additional credit for commas.
   a. **Example:** ^I^ have^3,567^dogs^.
   b. **Example:** ^I^ have^3567^dogs^.

**Punctuation**
1. Commas should be given credit when they are used correctly in a series, a date, or to set off punctuation. If used incorrectly, just ignore it.
   a. **Example:** ^I^ like^dogs^,^cats^,^and^canaroos^.
   b. **Example:** ^My^birthday^is^January^12^,^1969^.
2. Do not provide additional credit for correctly used apostrophes (e.g., you’ll, we’ll, I’m, St. Patrick’s).
   a. **Example:** ^We’ve^been^eating^a^lot^of^food^.
   b. **Example:** ^My^mom’s^brother^went^to^school^.
3. Periods should be given credit when they are used correctly in the context of abbreviations.
   a. **Example:** ^On^St^,^Patrick’s^Day^I^celebrated^.

**Grammar**
1. If a word is missing a possessive ‘s’ mark the incorrect sequence but count the word as spelled correctly
   a. Example: ^I^ went ^to^ grandma ^house
2. If a verb tense is incorrect, then only count an incorrect sequence for the incorrect noun-verb combination.
Run-On Sentences
1. If the sentence is a run-on sentence, the scorer must decide where the sensible ending is located. Place a vertical line and two incorrect writing sequences at this point.

   a. Example: Murray takes the train to school | X Mom rides the bus.

2. If a run-on sentence is connected by conjunctions, the scorer must determine where to break the sentence apart. Place a vertical line at this point. As a general rule, allow only one or two conjunctions per sentence.

   a. Example: She went to the store and asked for bread | X and looked at books and went home.

Spacing Issues
1. If a student separates a word like ‘homework’ into ‘home work’, follow the scoring example below:

   a. Example: I did my home work

2. If a student combines 2 words into 1 word (‘alot’ for ‘a lot”; ‘afew’ for ‘a few’; ‘noone’ for ‘no one’), score this as incorrect on both sides of the word, for example:

   a. Example: There were alot of pencils

Unfamiliar Names and Slang Words or Phrases
1. Children often make up names in their stories or use unfamiliar names. In general, do not count a proper name as misspelled unless it’s obvious that it is incorrect (e.g., spelling “Sue” incorrectly or misspelling a name that was spelled differently earlier in the passage).

2. Slang words, such as gonna, ok, yeah, gotta, kinda, are okay in dialogue only.

3. Like in the middle of the sentence is incorrect.

   a. Example: He wore like a t-shirt.

Concluding Sentence
1. At the end of the story, the student had to stop writing mid-word. Only count this for total words for the incomplete word.

   Example: We went to the
TITLE:
The Effectiveness of an Evidence-Based Performance Feedback Intervention Through Zoom Communications, Inc

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412 722 6410

STUDY OVERVIEW:
Writing fluency, the ability to write quickly and accurately, is a skill that many school-aged students struggle with. National data and empirical evidence have suggested the pressing need to improve students’ writing skills in the early elementary grades (Persky et al., 2003; NAEP, 2017). The Performance Feedback Intervention has been demonstrated repeatedly by researchers to help students to improve their writing fluency quickly within the classroom. The Performance Feedback Intervention involves a student writing a story from a story prompt (e.g., “The family decided to camp next to the waterfall because…) for 3 minutes. The researchers will then take the student’s writing and count all the words that they wrote. The next time the student meets with the researcher, the student will get feedback on how many words they wrote the previous time they worked together. If the student wrote more words than last session, there will be an upward arrow. If the student wrote less words than the last session, there will be a downward arrow. If the student wrote the same number of words, there will be an equal sign. After receiving their feedback from the prior session, the student will then complete another 3-minute writing prompt. This intervention will take place over Zoom on a one-on-one format, twice per week for 5-6 weeks within the school day. The student’s teacher will be assisting the student log in and out of Zoom. After the final writing session, the student will also be able to tell the researchers how they feel about the performance feedback intervention by answering eight different questions read by the researcher. This research project aims to implement the
Performance Feedback Intervention in a one-on-one virtual learning environment to determine whether the established procedures can be used effectively in a remote setting.

WHY IS THIS RESEARCH STUDY BEING DONE?
Your child is being asked to participate in a research project that seeks to investigate whether the Performance Feedback Intervention can be implemented over Zoom to improve students’ writing fluency.

In order for your child to participate in this study, your child must be:
(a) between grade 2 and grade 4, and
(b) referred by their school as a student who could benefit from additional writing practice.

WHAT WILL MY CHILD BE ASKED TO DO?
The things your child will be asked to do in this study include: Your child will be asked to join one-on-one Zoom sessions with a research assistant in which they will engage in the writing fluency intervention. Sessions will occur approximately twice per week for five to six weeks, and each session will last approximately ten to fifteen minutes. Each session will involve your child working with the research assistant to practice their writing fluency using the Performance Feedback Intervention. The intervention will be tailored to your child’s skill level (e.g., story writing prompt). Your child will receive individual attention and praise for their effort.

After the final intervention session, your child will be asked to provide their thoughts regarding the intervention, by completing an eight-item student rating form. A research assistant will read the items to your child over Zoom and record your child’s responses. This rating form will take no more than five minutes to administer.

These are the only requests that will be made of your child.

WHAT ARE THE RISKS AND BENEFITS OF THIS STUDY?
There are minimal risks associated with your child’s participation, but they are no greater than those encountered in everyday school activities. Potential benefits from participation include your child increasing their writing fluency, and a related boost in self-confidence that often accompanies achieving a difficult skill.

WILL MY CHILD BE PAID FOR TAKING PART IN THIS RESEARCH STUDY?
There will be no compensation for your child’s participation in this study, however, participation in the project will require no monetary cost to you or your child.

CONFIDENTIALITY:
Your child’s participation in this study and any personal information that your child provides will be kept confidential at all times and to every extent possible.

Your child’s name will never appear on any survey or research instruments. All written and electronic forms and study materials will be kept secure. No identity will be made in data analysis. Any study materials with personal identifying information will be maintained for three years after the completion of the research and then destroyed.
RIGHT TO WITHDRAW:
You are under no obligation to give your permission for your child to participate in this study, and you may withdraw your permission at any time by notifying a member of the research team. You may also choose your child’s data to be completely withdrawn from the study or choose to not allow any data collected to be used in the final statistical analysis.

SUMMARY OF RESULTS:
A summary of the results of this research will be supplied to you, at no cost, upon request.

FUTURE USE OF DATA:
Any information collected that can identify your child will have the identifiers removed and may be kept for use in future related studies, and/or provided to other researchers. A possible use for this data from this study might be to combine it with other similar writing study results in a more comprehensive analysis of remote writing interventions.

COVID-19 CONSIDERATIONS
I understand that the researcher(s) running this study have put in place the following guidelines to address concerns related to COVID-19:

● All sessions will be conducted via Zoom to eliminate the possibility of transmission of COVID-19 between researchers and participants.
● Materials will be given to the participants’ teacher, and they will have the option of returning them electronically or using researcher-provided envelopes to the school psychologist’s mailbox.

VOLUNTARY CONSENT:
I have read the above statements and understand what is being requested of my child. I also understand that my child’s participation is voluntary and that I am free to withdraw my permission for my child at any time, for any reason, without any consequences.

On these terms, I agree that I am willing to allow my child to participate in this research project and I give permission for my child to participate in this study.

I understand that should I have any further questions about my child’s participation in this study, I may contact Dr. Elizabeth McCallum at 412.722.6410. Should I have questions regarding protection of human subject issues, I may contact Dr. David Delmonico, Chair of the Duquesne University Institutional Review Board, at 412.396.1886.

______________________________
Parent / Legal Guardian’s Signature
Date__________________________

______________________________
Researcher’s Signature
Date__________________________
This project has been approved/verified by Duquesne University’s Institutional Review Board.
Appendix D

Student Assent

**Important Question ☺**

I would like to work with you each week for the next few months. We will be working on writing stories during school over the computer. Your parent has said that it is okay that I work with you. However, I want to make sure that it is okay with you. If you change your mind, it is okay to stop working with me at any time.

Would it be okay if I worked with you on writing?

| Yes | No |

Name: ____________________________________________
Appendix E

The zookeeper noticed that the cage was open and…

In the morning, I opened my door and saw five horses standing in the street. Then…

The people at the carnival were surprised that…

I was walking home from school when I found a $100 bill and…

When the snowstorm began, the lights went out just before…

The boy was on his way to see the dinosaur in the museum when…

One day I woke up and was invisible and…

Today I woke up for school and…

The best part about my school day is…

I was walking home from school when…

My favorite thing to do at recess is…

I found a time machine in my backyard and…

Over the summer I cannot wait to…

Three things that make me happy are…

If I could write about anything I would write about…

I am happy that it is Friday because…

The best trip I ever had was when…

The girl found a toy in the yard that…

I look forward to next school year because…
Appendix F

Kids Intervention Profile (KIP) Packet

1) How much do you like writing stories with us each week?

- Not at all
- A little bit
- Some
- A lot
- Very, very much

2) How much do you like being told what to write about?

- Not
- A little bit
- Some
- A lot
- Very, very much

3) Were there times when you didn’t want to write a story with us?

- Never
- A couple times
- Sometimes
- A lot of times
- Many, many times
4) Were there any times when you wished you could work more on writing stories with us?

- Never
- A couple times
- Sometimes
- A lot of times

5) How much do you like being told how many words you wrote?

- Not at all
- A little bit
- Some
- A lot
- Very, very much

6) How much do you think it helped you when you were told how many words you wrote?

- Not at all
- A little bit
- Some
- A lot
- Very, very much

7) Do you think your writing has improved?

- Not at all
- A little bit
- Some
- A lot
- Very, very much
8) Do you think your writing has gotten worse?

- Not at all
- A little bit
- Some
- A lot
- Very, very much
Appendix G

Resource Teacher Intervention Instruction Checklist

As the student participates in our weekly writing sessions, please follow this checklist ☺.

1) 15 minutes prior to the scheduled meeting time, check to ensure that you received the student’s individualized writing packet
2) 15 minutes prior to the scheduled meeting time, check that the reoccurring Zoom link that has been provided for you to click + log on to for that day
3) Check to ensure that the child’s individualized writing packet contains all needed pages
   a. Page 1 should contain the student’s identifying information
   b. Page 2 should contain the student’s individualized feedback
   c. Page 3 should contain a stop sign, a writing prompt, and a thought bubble
   d. Page 4 should contain a writing prompt with writing lines
   e. Page 5 should contain writing lines
4) 2 minutes prior to the scheduled meeting time, have the child sit in a quiet, non-distracting environment
5) Assist the student in logging onto the scheduled Zoom link that was attached to the reoccurring google calendar invite
6) At the scheduled meeting time, ensure that student is logged into the session
7) At the end of the session, the student will let you know that they are done
8) Collect the student’s writing packet from them
9) After the intervention agent has verbally confirmed they have received the writing packet, they will end the session
Appendix H

Duquesne University
2021-2022 Writing Project

___________ School

3rd grade

Name: ____________________________
Date: ____________________________
Here is how you are doing in writing:
One night I had a strange dream about…
One night I had a strange dream about ________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

_____________________________________

Keep going