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Using Wearable Biomarker Technology to Determine the Effectiveness of Assistive Technology Supports on the Anxiety and Writing Outcomes of Students with Disabilities

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Capstone Approval Page

Capstone Title (print or type)

Using Wearable Biomarker Technology
Determine the Effectiveness of Assistive Technology Supports on Anxiety and Writing Outcomes of Students with Disabilities

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Abstract

The purpose of this Capstone project is to determine the effects writing has on stress levels of students with anxiety-related disorders and to investigate the effectiveness of technology-based writing interventions to reduce anxiety and increase writing output when being utilized by students. One male and three females between the ages of 14-17 participated in the research. Each participant wore a biomarker device that allowed the researchers to track the participants’ levels of anxiety. The levels transmitted by the biomarker would indicate a state of calm, focused, tense and neutral. Baseline involved observing students writing without technology supports. Upon completion of a baseline period, two writing interventions (i.e., Chromebook or Read & Write) were implemented into the educational procedures. The effectiveness of the interventions was tracked by collecting data regarding the students’ anxiety levels as evidenced by the biomarker technology and direct observation, as well as by comparison of writing samples collected during the baseline period of the research with the samples collected during intervention phases. Sample lesson plans have been created based on the results of this research.

Although results were not significant, the interventions did result in limited success for some of the participants. The resulting data collected implies that further research would be beneficial to this study.

Keywords: Anxiety, Writing Interventions, Biomarker Technology, Assistive Technology
Using Wearable Biomarker Technology to Determine the Effectiveness of Assistive Technology Supports on the Anxiety and Writing Outcomes of Students with Disabilities

School may invoke a myriad of emotions amongst many children. The growing demands of stricter standards and testing added to the varying socioeconomic backgrounds of students seems to correlate with a growing number of children with anxiety disorders. Research has indicated up to 28% of typically developing children have been diagnosed with an anxiety-related disorder (Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005). Anxiety disorders have quickly become one of the most commonly reported psychological disorders to affect both children and adolescents (Anderson, Williams, McGee & Silva, 1987; Kashani & Orvaschel, 1988; Barrett & Turner, 2001 et al). The incidence of anxiety-related disorders increases to a staggering 40% to 50% of when considering students with Autism Spectrum disorder (ASD).

Students with emotional and behavior disorders (E/BD) also often display behaviors such as defiance, physical aggression and avoidant behaviors which pertain to anxiety experienced in response to various school expectations. Some such expectations known to increase anxiety amongst students with ASD or E/BD are routines (or changes made to them) and work task requirements (Hendrickx, 2015) in such subjects as mathematics, science, and language arts.

Under the subject of language arts, writing tends to be a particular challenge amongst both students with Autism spectrum disorder and Emotional behavior disorders. According to studies, up to 60% of individuals with Asperger’s Syndrome (or High Functioning ASD) display disabilities with regards to writing (Dickerson, Mayes & Calhoun, 2008). Students with emotional behavior disorders also often face challenges
when presented with writing tasks. Students with EBD often perform below grade level in both math and language arts (Lane, et al, 2008). Without providing appropriate interventions, the learning gap of students with ASD and EBD with their typically developing peers will grow. With this information in mind, it is crucial to research the most effective practices to help support students who display anxieties when writing. Researchers must ask: “When do the students display the anxiety?” “What interventions are effective in reducing anxiety?”, and finally “What interventions are effective in increasing the greatest output of student work?” The data collected can then be used to determine the best practices to support students with ASD and EBD in their writing tasks.

**Methods for Assessing Anxiety**

It has been recommended by many researchers to conduct a multi-method approach when assessing anxiety among students with ASD or EBD. These methods may include behavioral interviews, direct observation of behavior, rating scales, and review of psychological measures (Hagopian & Jennet, 2008; Kerns, Rump, Worley, Kratz, Mc Vey, Herrington, et. al 2016; March, Parker, Sullivan, Stallings & Conners, 1997; McLoone, Hudson & Rapee, 2006). Rating scales, or self-report questionnaires are often a preferred mean of assessment of anxiety for both for students with ASD and those with EBD. While not used for the purpose of diagnosis, rating scales are an effective method to identify students with anxiety from amongst the entire school population. (McLoone, Hudson & Rapee, 2006). One challenge when conducting rating scale assessments is the likelihood of difficulty for some students with ASD who struggle with communicating verbally to participate fully in the assessment process. This challenge is often addressed by the completion of the questionnaires or rating scales
being performed by caregivers and/or practitioners who work directly with the students (Hagopian & Jennett, 2008; Moskowitz et al, 2013; Moskowitz, Rosen, et al, 2017). Additional assessment of students with anxiety may be done through clinical interviews. By using clinical interviews, specific types of anxieties displayed can be determined by clinicians (McLoone, Hudson & Rapee, 2006). Direct observation is an additional method of assessing anxiety levels in students. This method of assessment allows behavior analysts to consider environmental variables with regards to anxiety while also assessing quantifiable amounts of observable behaviors associated with anxiety. (Van Laarhoven, Johnson, Hammond, Burgin, Carter, McCormick, Bailey, Monterosso, Riesen & Hoffman, 2018). When combined with rating scales and clinical interviews, direct observation is an effective method of verification of results of behavior assessment. (Moskowitz, Rosen, et al, 2017).

Two recent methods of research being conducted to assess levels of anxiety among individuals with high-functioning autism are Experience Sampling Methodology (Hare, Gracey & Wood, 2016) and Ecological Momentary Assessments (Khor, Gray, Reid & Melvin, 2014). Both methods of assessment involve the use of mobile platforms. A key component to both assessments is the self-reporting of behaviors and/or feelings of participants made through use of mobile platforms. Results from the Ecological Momentary Assessments (EMA) study revealed that by providing accessibility to real-time recording of stress and coping levels over a time frame of two weeks, some concurrent validity was recorded by participants (Khor, Gray, Reid & Melvin, 2014). The Experience Sampling Methodology (ESM) was conducted by requiring participants to complete questionnaires upon a prompt of a signal at random intervals. The
questionnaires assisted in determining behaviors and feelings in response to context and time. The participants were then provided with stress management methods in direct response to their baseline results. The data collected through this research has indicated that upon completion of the intervention phase, reduction of anxiety and/or improved mood were increased (Van Laarhoven, Johnson, Hammond, Burgin, Carter, McCormick, Bailey, Monterosso, Riesen & Hoffman, 2018).

Researchers have also recommended a form of assessment that measures physiological responses in direct relation to anxiety (Chok, Demanche, Kennedy & Studer, 2010; Hare, et al, 2016, Moskowitz, et al, 2013). This method of assessment recruits the measurement of heart rate (HR), blood pressure (BP), respiratory and/or breathing patterns (Choi & Guiterrez-Osuna, 2009), and muscle tension as a means to determine levels of anxiety. To date, research conducted with the utilization of biomarkers has been used largely in the medical field and lab settings. However, with recent advancements in science, biofeedback data may now be collected through the use of wearable devices. Through biofeedback, measurement of physiological functions can be directly correlated with external factors. In addition to these benefits, real-time self-regulation can be engaged to assist individuals when experiencing anxiety (Lakudzode & Rajbhoj, 2016).

**Methods for Assessing Writing Output**

Another aspect to consider is the skill level of students as it pertains to writing. As was previously mentioned, students with ASD and EBD often struggle in the domain of writing. It is therefore necessary to consider writing output as a means to determine effective interventions to improve students’ academic achievement. Assessment of
writing output can be administered through a variety of methods. A determination of words written can be determined, which would require counting the number of words, question marks, exclamation points and numbers written by the student. Other factors to consider when assessing the writing of students are punctuation, numbers of sentences written, and number of paragraphs written.

One final consideration when determining a student’s writing output is the measurement of correct writing sequences written by the student. Correct writing sequences is a scoring of the total number of adjacent units of writing found to be correct. In order to be considered as correct, two adjacent units of writing are found to have correct punctuation, spelling, capitalization, syntactical and semantic usage. The scoring of correct writing sequences requires the presence of two adjacent words, which are spelled correctly as well as being used correctly in context (Allen, Poch, & Lembke, 2018). This method of writing assessment closely aligns with measuring writing progress against informal standards of American English (Wright, 2013).

**Interventions for Writing Improvement**

There have been a variety of approaches researched to ascertain validity and effectiveness of writing interventions. One methodology of focus is that improving the reading abilities of students will concurrently and beneficially effect their writing abilities. The correlation between increased reading aptitude and increased writing measures has been confirmed at a rate of up to 85% (Graham, Liu, Bartlett, Ng, Harris, Barkel, Aitkin, Kavanaugh & Talukdar, 2018).

Strategy approaches to writing interventions have also been found to be effective practices in improving writing amongst struggling writers (Cook & Bennett, 2014). One
strategy shown to be successful among students with disabilities is Self-Regulated Strategy Development (SRSD). SRSD can be used for students ranging from kindergarten to Grade 12 and can be implemented at various reading levels. The strategy has proven to be a quality intervention for struggling writers. (Cook & Bennett, 2014).

In recent years, the use of technology as a method of educational intervention has become a more prevalent topic. Students often have access to tablets iPads, or Chromebooks in their classrooms, and teachers are learning ways to effectively utilize this to best assist in their students’ learning. A recent study published in the British Journal of Educational Technology further supports this concept, citing that the use of educational technology-based writing instruction resulted in a positive impact on students’ writing outcomes (Little, Clark, Tani, & Connor, 2018). A study published in 2017 indicated an improvement in students’ writing scores with the implementation of the SRSD strategy being used in conjunction with computer software designed specifically to support students in language arts strategies (Erickson, Geist, & Hatch, 2017). With consideration of these findings, this study was formed.

The purpose of this pilot study was two-fold. The first component of this study was to investigate the effectiveness of two technology-based writing interventions on the reduction of anxiety in students, as determined through the use of biomarker technology, as well as direct, anecdotal observation. Additionally, this study was established to determine the rate of improvement that both technology-based writing interventions produced with regards to students’ Words Written and Correct Word Sequences as well as with their anxiety levels. Specifically, we were interested in 1) Determining if technology-based writing interventions improved students’ writing, and 2) Determining if
these technology-based interventions resulted in an increase or decrease on the students’ anxiety levels.

**Method**

The following is an overview of research procedures followed during preparation and execution of this study.

**Participants**

One male and three females enrolled in a private therapeutic day school serving adolescents with social and emotional disabilities participated in this study. The participants were between the ages of 14 and 17 and came from diverse cultural backgrounds. The students participating in this study came from diverse cultural backgrounds. Participants were referred to the therapeutic day school setting when their need for social-emotional supports exceeded the capacity of a mainstream school setting and their placements were funded by their referring school districts. Any students enrolled in this program were required to have IEPs and to qualify under any of the following eligibilities: Autism Disability (AD), Emotional Disability (ED), or Other Health Impairments (OHI) (See Table 1).

One student participating in the current project carried a secondary eligibility of Specific Learning Disability (SLD). Participants fell under the primary eligibilities of ED or AD. All participants were diagnosed with a mood disorder, and three of the four participants also had a current diagnosis of ADHD. One important note is that the students participating in the current study had also shared current or past diagnoses of severe anxiety disorders.
Sophie. Sophie was a 16-year-old female participating in the study. Sophie’s diagnoses at the time of the project were: Bi-Polar Disorder, Generalized Anxiety Disorder, and Fetal Alcohol Syndrome. Sophie would display anxious behaviors in the form of rigid thinking, an inability to engage in non-preferred activities, an unwillingness to follow directions, an elevated volume level when speaking, pacing, demonstrating a difficulty in shifting from preferred to non-preferred activities or topics and verbal impulsivity.

Jason. Jason was a 15-year-old, and the only male participant in the study. Jason’s diagnoses at the time of the project were: ADHD, Generalized Anxiety Disorder, and he received Special Education services under the Eligibility of Specialized Learning Disabilities (SLD). Jason had been known to display anxious behaviors such as putting his head down during class, averting eye contact, giving only short responses to questions, as well as a slow response time to directions given and an increased need for prompting while working in class.

Mary. Mary was a 17-year-old female participating in the study. Mary’s diagnoses at the time of the project were: Generalized Anxiety Disorder, Major Depressive Disorder, and ADHD. Mary would display anxious behaviors in the form of elevated volume of voice, elopement from classroom, pacing, crying, shaking and calling home when unprompted, verbalizing threats to leave, lack of eye contact, and a difficulty in transitions from preferred to non-preferred activities or topics.

Evelyn. Evelyn was a 17-year-old female participating in the study. Evelyn’s diagnoses at the time of the project were: PTSD, ADHD, Generalized Anxiety Disorder, Major Depressive Disorder, and Binge Eating Disorder. Evelyn would display anxious
behaviors in the form of putting her head down during class, elopement from the
classroom, short responses to questions, delay in following directions, crying, shaking,
and averting eye contact.

Setting

This study was conducted in a therapeutic day school located in the western
Chicago suburbs. The school is an alternative school, serving students with social and
emotional disabilities. The baseline and intervention sessions were conducted in a
language arts classroom, as well as in a conference room within the school building.
Participants were provided with Spire Stone Devices at the beginning of each session,
which they positioned on their waistbands or bra straps during transition period before
language arts class. During each session, the participants were first observed in their
language arts classroom to establish an initial five minutes of observation before
implementing the writing prompt. When the writing prompt was provided to the
classroom, the participants and researchers moved to a private conference room to allow
participants to utilize the writing interventions away from the classroom. This process
was followed for the baseline periods, as well as for both implemented interventions.
Upon completion of a ten-minute period allowed for writing time, the students returned to
the classroom, and were observed for five minutes to gain additional data.

Instructional Equipment and Materials

The following is an overview of the wearable device used in this study to measure
the respiration patterns of the participants, the accompanying mobile app that was used to
classify the breathing patterns in correlation with cognitive or emotional states, the
personal device equipped with word processing capability used for both interventions and
Texthelp Read and Write software used during intervention. Figure 1 displays the wearable device and samples of associated app features.

<Insert Figure 1>

**Spire Stone.** Spire Stones are small, wearable devices that can notify the wearers or other observers of stress levels. More information on Spire Stones can be found at https://www.spire.io/ The device measures at 1.7 X 0.6 X 1.2 inches and weighs 0.8 ounces. Spire Stones can be worn on the waistband or bra strap. The device has built in sensors are designed to detect the expansion and contraction of the torso as the users breathe. This data allows the device to track activity of the users. The smooth side of the stone rests against the skin, and the clip is attached to the previously mentioned articles of clothing. For the purpose of this investigation, the participants clipped the Spire Stone to either their waistband or bra strap.

**Spire Breath + Activity Tracker: Discover Calm App.** The Spire Breath and Activity Tracker app is available within iTunes and Google Play as a free app. The app displays breath waves in real-time on home screens when the Spire Stones have been synched to a device for viewing. The Spire app uses algorithms to signify the respiratory patterns of the participants into correlating emotional or cognitive states. For the purpose of this study, the app was loaded onto iPod Touch systems, and was downloaded from https://itunes.apple.com/us/app/spire-breath-activity-tracker-discover-calm/id919933908?mt=8 Observers used the iPod devices to view whether the participants wearing the Spire stones were showing breathing patterns that indicated whether they were experiencing a Calm, Focused, Tense or Neutral state.

<Insert Figure 2>
**Chromebooks.** The participants in this study used Samsung Chromebook 3’s for Condition 1 and Condition 2 of this study. Further information regarding the Chromebook 3 can be found at this link:

[https://www.samsung.com/us/computing/chromebooks/under-12/chromebook-3-11-6-32gb-hdd--4gb-ram--xe500c13-k03us](https://www.samsung.com/us/computing/chromebooks/under-12/chromebook-3-11-6-32gb-hdd--4gb-ram--xe500c13-k03us)  

During both intervention phases, Chromebooks were utilized to assist the participants in their writing tasks. The observers created and dated a new Google document for the students on Chromebooks that were assigned to them individually. The students were then encouraged to type their writing assignment into the document. Upon conclusion of the writing session, the document was saved. The students used Chromebooks for both this form of intervention, as well as an additional intervention utilizing Texthelp Read and Write software.

<Insert Figure 3>

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**Texthelp Read and Write software.** During intervention phase 2, the participants were provided access to the assistive technology software, Texthelp Read and Write. The software was accessible through the use of the Chromebooks assigned to the students during intervention phase 1 (typing writing assignment on Chromebooks word processing software). Before implementing the Texthelp Read and Write intervention, the participants were given instruction on the various features of the software through a tutorial video and practice. The brief tutorial video was viewed by the participants in a classroom setting. Upon completion of their viewing, a sample document was typed by the participants, during which they were able to access and work
with facets of the software, such as Talk & Type, Picture Dictionary, Prediction, and Read Aloud features. Upon completion of the Texthelp Read and Write tutorial session, the students were given access to the software on days in which it was the available intervention.

**Research Conditions and Procedures for Each Phase**

**Pre-baseline Condition.** Prior to the baseline and research phases of this study, participants were given instruction on where to position their Spire Stone and were asked to wear the biomarker for a period of time. Individualized accounts were established on the Spire Stone apps, each based on the individual’s characteristics, such as height, weight and age. By entering this individualized information into the Spire Stone app, the program could then calculate the individual participants’ breathing patterns.

**Baseline.** During the baseline phase of this study, researchers provided the participants with Spire Stones at the beginning of their Language Arts instructional period. Participants completed the daily writing response with the use of pencil and paper. They were observed in the academic classroom (Language Arts) and data were collected on breathing patterns indicated on the home screen of the Spire App, as well as of calm and disruptive behaviors noted through direct observation.

**Condition 1: Chromebook Texthelp Docs Word Processing.** During the implementation of condition 1, the participants were provided access to Google Docs through use of Chromebooks. The participants were familiar with these tools and required no additional training with regards to this condition. During this condition, the participants typed their writing responses in the Google Doc, while wearing the Spire device. The students were observed in both the academic classroom, as well as a private
conference room. Data were collected during observation on the participants’ state of either calm or disruptive behaviors, in addition to data collected on breathing patterns indicated on the home screen of the Spire App.

**Condition 2: Texthelp Read and Write Software.** Upon the introduction of Condition 2, the participants were given access to the Texthelp Read and Write software on their individual Chromebooks. Participants were encouraged, however not required to utilize the assistive technology application during their writing process. The participants were observed in the academic classroom during the five minutes preceding receiving of the writing prompt, in a private conference room where they were provided Chromebooks equipped with Texthelp Read and Write, and headphones during the writing portion of their lesson, and in the academic classroom for five minutes following the writing phase of the lesson. Data were collected during observation regarding the breathing pattern indications viewed on the home screen of the individual participants’ Spire Apps, as well as time sampling observation of participants’ state of behavior—indicated as being either calm or disruptive.

**Experimental Design**

To compare the effectiveness of the Texthelp Read and Write software and the use of Google Docs via Chromebook on calm and disruptive behaviors and the breathing patterns of participants during an academic class session, an alternating treatments design was implemented. By utilizing this design, more than one treatment condition can be introduced in a rapidly alternating fashion with the order of presentation being randomized to allow for comparison of the effects of the two interventions on the same
behavior or skill. Little to no overlap between data paths demonstrates a functional relation, whereas increased distance between the data paths demonstrates a larger effect (Worlery, Bailey & Sugai, 1998).

**Dependent Measures and Data Collection**

The following are dependent measures and data collection procedures used for each phase of the study. The procedures listed were followed and data were collected in both the baseline and the intervention phases.

**Percent of Intervals with Calm Behavior.** During the 5 minutes of pre-writing, 10 minutes of performing the writing task, and 5 minutes of post-writing in an academic setting, participants’ behavior, indicated as calm, was measured with the use of Momentary Time Sampling. This was done by observing participants systematically and performing rotations between students for 20 second intervals of each minute. Percent of Intervals indicating calm behavior were determined by dividing the number of intervals with calm behavior by the total number of intervals and multiplying by 100.

**Percent of Intervals with Disruptive Behavior.** During the 5 minutes of pre-writing, 10 minutes of performing the writing task, and 5 minutes of post-writing in an academic setting, participants’ behavior, indicated as disruptive, was measured with the use of Momentary Time Sampling. This was done by observing participants systematically and performing rotations between students for 20 second intervals of each minute. Percent of Intervals indicating disruptive behavior were determined by dividing the number of intervals with disruptive behavior by the total number of intervals and multiplying by 100.
**Respiration Patterns as Measured by Spire Device.** During the 5 minutes of pre-writing, 10 minutes of performing the writing task, and 5 minutes of post-writing in an academic setting, participants’ respiration patterns were recorded by implementation of Momentary Time Sampling. This was done by performing systematic rotations between students for 20-second intervals each minute. Researchers observed the Activity Tracker app upon the completion of each interval and marked the respiration pattern visible on the device at that point in time. These indications were marked as either Tense, Focused, Calm, or Neutral. The percent of intervals with each respiration pattern were calculated by dividing the number of intervals with each breathing pattern by the total number of intervals and multiplying by 100.

**Total Words Written for Paper and Electronic Writing Samples.** Writing samples were collected from participants upon completion of the writing tasks assigned during each session. During baseline sessions, the writing samples were handwritten on paper. Upon implementation of the intervention phases, the writing samples were printed from the word processing document they were typed into. Observers then counted the total number of words written for each line of text. The sum of words for each line was listed to the right side of coinciding text. Contractions, acronyms and numbers were each indicated as one word. Question marks and exclamation points were also indicated as a word and were added to the total. Upon completion of listing the word count for each line of text, the number of total words for each line of text were then added to determine the total words written for the writing sample.

**Correct Word Sequences for Paper and Electronic Writing Samples.** Writing samples were collected from participants upon completion of the writing tasks assigned
during each session. During baseline sessions, the writing samples were handwritten on paper. Upon implementation of the intervention phases, the writing samples were printed from the word processing document they were typed into. Observers then counted the correct word sequences written for each line of the text. The sum of sequences for each line was listed to the left side of coinciding text. Correct word sequences were scored when two adjacent units of writing were found to be correct in punctuation, capitalization, spelling, syntactical and semantic usage. Upon completion of listing the sequence count for each line of text, the number of total words for each line of text were then added to determine the total correct writing sequences for the writing sample.

**Interobserver Agreement and Treatment Fidelity**

Additional authors conducted in vivo reliability sessions for 92% of all sessions (including baseline and intervention phases). The percentage agreement index (i.e., number of agreements divided by number of agreements plus disagreements and multiplied by 100) was used to calculate interobserver agreements for all dependent measures involving interval recording. This would include the percent of intervals of calm and disruptive behaviors and various breathing patterns. Mean interobserver agreement was 96.67% with a range of 92-100%.

Calculations were made for reliability of the scoring of correct word sequence for 21% of all intervention phases/conditions. Calculation of IOAs were made by dividing the smaller score of writing samples for which reliability was calculated regarding correct word sequences by the larger of the scores and multiplying by 100. The mean interobserver agreement was 99% for this measure. Additionally, the second observer
collected procedural reliability/treatment fidelity for 92% of all sessions. Questions answered by the secondary observer at the end of each observational session were as follows: 1) Did the experimenter implement the correct planned condition? 2) Did the students wear the Spire Stone during writing class? 3) Were the students told they would be writing an informational response about a specific topic? 4) Did the teacher pass out the writing prompt and Chromebook? 5) Did the teacher ask students to open Chromebook and find the folder dated the current date and the document that corresponds with that date? 6) Did the teacher ask the students to open the Texthelp Read and Write application (on days when Condition 2 was implemented)? 7) Did the teacher hold up the prompt sheet for students to see and explain the paper has the topic for their informational response? 8) Did the teacher read the prompt aloud and ask students to read the prompt silently? 9) Did the teacher remind students to only write about the topic? 10) Did the teacher tell the students to think about the topic before writing? 11) Did the teacher tell the students they can write notes on the writing topic page? 12) Did the teacher tell the students to write on the Google document? 13) Did the teacher remind the students to express their thoughts clearly and to make their writing interesting to the reader? 14) Did the teacher ask the students if they had any questions? 15) Did the teacher inform the students that the teacher will not be able to answer questions and that the students should try their best? 16) Were the students informed that when they finished writing they should save their document and sit quietly? 17) Were the students who finished early informed that they could draw on the back of their paper (only if necessary)? 18) Were the students instructed when to begin writing? 19) Upon conclusion of administering the writing sample, did the teacher collect the materials? 20)
Were the students given the correct instruction materials? Procedural reliability was calculated by dividing the number of correct measures by the total number of assessed variables and multiplying by 100%. Procedural reliability for this study was 94%.

Social Validity. Upon completion of the investigation, participants were asked to complete a survey pertaining their rate of satisfaction with using the Texthelp Read & Write software, Chromebooks, and wearing the Spire Stones. They were asked the following questions: 1) Was using a pencil and paper beneficial to your writing? 2) Did you find that using the Chromebook was beneficial to your writing? Participants were also asked to rate the following statements regarding the Texthelp Read and Write App: “I thought the prediction feature was beneficial to my writing.”, “I thought the picture dictionary was beneficial to my writing.”, “I thought the talk & type feature was beneficial to my writing.”, and “I thought the text to speech feature was beneficial to my writing.” The participants were asked to rate the statements from following range of choices: “Did Not Use”, “Not Beneficial”, “Somewhat Beneficial”, “Beneficial”, and “Extremely Beneficial”. Based on Social Validity Data, one of three participants indicated they enjoyed using the Texthelp Read & Write software. Three of three participants indicated that the Spire Stone caused no little or no discomfort when being worn. A fourth participant was absent the final day of the study, and therefore social validity data was not collected regarding them.

Results

The following is an overview of results across dependent measures.
**Percent of Intervals with Calm and Disruptive Behavior**

Results of this study indicated only minor differences between baseline and research conditions with respect to direct observations and disruptive behavior. One participant displayed disruptive behavior during the first day of observation, displaying only calm behavior throughout the remainder of the study. One participant displayed calm behaviors throughout the study, with exception of one day of observation in which disruptive behaviors were displayed. One participant displayed disruptive behaviors during one baseline observation and one intervention observation, the behavior displayed being calm for the remainder of observation days. The fourth participant was observed to display disruptive behavior upon four days of observation during intervention, an increase from only displaying calm behaviors throughout the baseline period. While disruptive behaviors were observed, all four participants were engaged in calm behaviors for nearly all of the sessions, the few instances of disruptive behavior being displayed with 0 instances occurring in most sessions across baseline and research conditions.

**Respiration Patterns as Measured by Spire Device**

**Statistical analyses for this study are forthcoming.**

**Sophie**  Figure 6 displays the percentage of intervals Sophie’s device indicated calm and neutral respiration rates across baseline, Chromebook and Texthelp Read and Write intervention phases. No indication of Focus or Tense notifications were indicated for Sophie throughout the course of this study. Figure 7 shows the mean percentage of Sophie’s four respiration measures across conditions. Sophie demonstrated more calm respiration rates across the baseline (33.3% of intervals) compared to the Chromebook
intervention (0%) and implementation of the Texthelp Read and Write intervention (6%) sessions. Sophie demonstrated no Tense or Focused breathing patterns throughout the duration of this study. Sophie demonstrated an increase in the incidence of Neutral breathing patterns between baseline (66.7%) and Condition 1-Chromebook intervention sessions (100%), she also displayed an increase from baseline during Condition 2- Texthelp Read and Write intervention (94%).

Figure 8 displays the total words written by Sophie across the baseline and across both conditions of this research. Sophie demonstrated an increase in average total words written between the baseline condition and condition one-the implementation of Chromebook usage to complete writing tasks. The average total words written by Sophie during the baseline period was 54.3 words per session. The mean of total words written increased to 78.25 total words written per session while utilizing a Chromebook. This indicates an increase of total words written (44.1%) upon the implementation of Condition 1. The mean score of total words written increased from baseline to 89.4 total words written per session while utilizing Texthelp Read and Write. This indicates an increase of total words written (64.6%) upon the implementation of Condition 2 when measured against baseline. Figure 9 displays the correct word sequences recorded for Sophie throughout the course of this study. The average correct word sequences written by Sophie was recorded at 41.3 during baseline. Upon implementation of Condition 1 (Chromebook), the average correct word sequences written by Sophie per session was recorded at 66.75. These results indicate an increase in correct word sequences (61.6%) from baseline to the Condition 1 intervention. Upon implementation of Condition 2 (Texthelp Read and Write), the average correct word sequences Sophie performed per
session was recorded at 85. These results indicate a significant increase in correct word sequences (105.8%) from baseline to the Condition 2 intervention. The data regarding Sophie’s writing scores indicates that Condition 2 (Texthelp Read and Write) resulted in a greater score of both total words written and correct word sequences performed than during Condition 1 (Chromebooks) or baseline, and therefore the utilization of Condition 2 was more beneficial for Sophie’s writing output.

<Insert Figure 6>
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**Jason.** Figure 10 displays the percentage of intervals Jason’s device indicated calm, tense, focused and neutral respiration rates across baseline, Chromebook, and Texthelp Read and Write intervention phases. Figure 11 shows the mean percentage of Jason’s four respiration measures across conditions. Jason demonstrated more calm respiration rates across the baseline (14.5% of intervals) as compared to the Chromebook intervention (5.7%) and implementation of the Texthelp Read and Write intervention (0%) sessions. Jason demonstrated less Tense breathing patterns during baseline (0%) than during the implementation of Condition 1-the use of Chromebooks (13.6%), an increase in Tense notifications was also evident during Condition 2-Read and Write intervention phase (21%). Focused breathing patterns for Jason increased from baseline (0%) to Condition 1-Chromebook (4%) as well as during Condition 2-Texthelp Read and Write (7%) intervention. Jason demonstrated a decrease in the incidence of Neutral breathing patterns between baseline (85%) and Condition 1-Chromebook intervention
sessions (76.7%), and he displayed limited difference during Condition 2-Texthelp Read and Write intervention (72.6%).

Figure 12 displays the total words written by Jason across the baseline and across both conditions of this research. Jason demonstrated a decrease in average total words written between the baseline condition and Condition one-the implementation of Chromebook usage to complete writing tasks. The average total words written by Jason during the baseline period was 88 words per session. This number decreased to 55.8 total words written per session while utilizing a Chromebook. This indicates a decrease of total words written (36.6%) upon the implementation of Condition 1. Jack’s total words written decreased from baseline to 63.25 total words written per session while utilizing Texthelp Read and Write. This indicates a decrease of total words written (28.1%) upon the implementation of Condition 2 as compared to baseline. Figure 13 displays the Correct Word Sequences written by Jason across the Baseline and implementation of both conditions (Chromebook and Texthelp Read and Write). The average correct word sequences written by Jason was recorded at 57.5 during baseline. Upon implementation of Condition 1 (Chromebook), the average correct word sequences written by Jason per session was recorded at 52.8. These results indicate a decrease in correct word sequences (8.2%) from baseline to the Condition 1 intervention. Upon implementation of Condition 2 (Texthelp Read and Write), the average correct word sequences performed by Jason per session was recorded at 63.5. These results indicate an increase in correct word sequences (10.4%) from baseline to the Condition 2 intervention. The data regarding Jason’s writing indicates a greater writing output during baseline than Condition 1, and a
minimal increase in correct word sequences during Condition 2. Based upon these results, baseline seemed to be more beneficial to Jason’s writing output than either condition.

<Insert Figure 10>
<Insert Figure 11>
<Insert Figure 12>
<Insert Figure 13>

Mary. Figure 14 displays the percentage of intervals Mary’s device indicated calm, tense, focused and neutral respiration rates across baseline, Chromebook and Texthelp Read and Write intervention phases. Figure 15 shows the mean percentage of Mary’s four respiration measures across conditions. Mary demonstrated less calm respiration rates across the baseline (0% of intervals) as compared to the Chromebook intervention (19%). Mary showed no change in calm respiration rates between baseline and the implementation of the Texthelp Read and Write intervention (0%) sessions. Mary demonstrated the same percentage of Tense breathing patterns during baseline (0%) and during the implementation of Condition 1—the use of Chromebooks (0%). The percentage of tense breathing patterns demonstrated by Mary increased during Condition 2—Read and Write intervention phase (6%). Focused breathing patterns for Mary decreased from baseline (14.5%) to Condition 1—Chromebook (10.7%) as well as during Condition 2—Texthelp Read and Write (4%) intervention. Mary demonstrated a decrease in the incidence of Neutral breathing patterns between baseline (85.5%) and Condition 1—Chromebook intervention sessions (70.2%), and she displayed an increase in difference from baseline to during Condition 2—Texthelp Read and Write intervention (90%).
Figure 16 displays the total words written by Mary across the baseline and both conditions of this study. Mary demonstrated an increase in average total words written between the baseline condition and condition one—the implementation of Chromebook usage to complete writing tasks. The average total words written by Mary during the baseline period was 86.5 words per session. The average total words written per session by Mary was 92.5 during Condition 1—Chromebook utilization. This indicates an increase of total words written (6.9%) upon the implementation of Condition 1. The average number of total words written by Mary per session was 55 while utilizing Condition 2—Texthelp Read and Write. This indicates a decrease of total words written by Mary from baseline upon the implementation of Condition 2 (36.4%). Figure 17 displays the Correct Word Sequences written by Mary across the Baseline and both conditions (Chromebook and Texthelp Read and Write). The average correct word sequences written by Mary was recorded at 64.5 during baseline. Upon implementation of Condition 1 (Chromebook), the average correct word sequences written by Mary per session was recorded at 89.5. These results indicate an increase in correct word sequences (38.8%) from baseline to the Condition 1 intervention. Upon implementation of Condition 2 (Texthelp Read and Write), the average correct word sequences performed by Mary per session was recorded at 53.6. These results indicate a decrease in correct word sequences (16.9%) from baseline to the Condition 2 intervention. Based on the data collected regarding Mary’s writing scores, Condition 1 (Chromebooks) was more beneficial toward the increase of Mary’s writing output.
Evelyn. Figure 18 displays the percentage of intervals Evelyn’s device indicated calm, tense, focused and neutral respiration rates across baseline, Chromebook and Texthelp Read and Write intervention phases. Figure 19 shows the mean percentage of Evelyn’s four respiration measures across conditions. Evelyn demonstrated more calm respiration rates across the baseline (4.7% of intervals) compared to the Chromebook intervention (0%) and implementation of the Texthelp Read and Write intervention (0%) sessions. Evelyn demonstrated an increase in Tense breathing patterns from baseline (0%) and the implementation of both Condition 1-Chromebook (31.8%) and Condition 2-Texthelp Read & Write (21.5%). Focused breathing patterns for Evelyn increased from baseline (0%) to the implementation of Condition 1 (14.2%). There was no change in focused breathing patterns between baseline (0%) and Condition 2 (0%). Evelyn demonstrated a decrease in the incidence of Neutral breathing patterns between baseline (86%) , Condition 1-Chromebook intervention sessions (54%), and Condition 2-Texthelp Read and Write intervention (78.5%).

Figure 20 displays the Total Words Written by Evelyn across baseline and both conditions. Evelyn demonstrated an increase in average total words written between the baseline condition and condition one-the implementation of Chromebook usage to complete writing tasks. The average total words written by Evelyn during the baseline period was 106 words per session. This statistic increased to 118.8 total words written per session by Evelyn while utilizing a Chromebook. This indicates an increase of total words written (12.1%) upon the implementation of Condition 1. Evelyn’s writing score
increased from baseline to 120.75 total words written per session while utilizing Texthelp
Read and Write. This indicates an increase of total words written (13.9%) upon the
implementation of Condition 2. Figure 21 displays the average correct word sequences
performed by Evelyn across baseline and both conditions. The average correct word
sequences written by Evelyn was recorded at 105.5 during baseline. Upon
implementation of Condition 1 (Chromebook), the average correct word sequences
written by Evelyn per session was recorded at 109.8. These results indicate an increase
in correct word sequences (4.1%) from baseline to the Condition 1 intervention. Upon
implementation of Condition 2 (Texthelp Read and Write), the average correct word
sequences Evelyn performed per session was recorded at 121.5. These results indicate an
increase in correct word sequences (15.1%) from baseline to the Condition 2 intervention.
Based on the data collected regarding Evelyn’s writing scores, Condition 2 was most
beneficial toward increasing both the total words written and correct word sequences
performed by Evelyn.

<Insert Figure 18>
<Insert Figure 19>
<Insert Figure 20>
<Insert Figure 21>

**Overall Summary.** Two participants demonstrated an increase in tense breathing
patterns from baseline to both Condition 1 and Condition 2. One participant
demonstrated an increase in tense breathing patterns from baseline to Condition 2, and
one student showed no incidence of tense breathing patterns throughout baseline nor
either condition. Three of the four participants (Stephani, Jason, and Evelyn)
demonstrated a decrease in calm breathing patterns from baseline to either condition. Interestingly, one participant (Mary) demonstrated an increase in calm breathing patterns during Condition 1, but no change in calm breathing patterns between baseline and Condition 2. Sophie demonstrated no incidence of focused or tense breathing patterns throughout the course of this study. While Mary demonstrated a decrease in focused breathing patterns from baseline through both conditions, Jason demonstrated an increase of focused breathing patterns from baseline to both Condition 1 and Condition 2. Evelyn demonstrated an increase in focused breathing patterns from baseline to Condition 1, but no increase from baseline to Condition 2. Two participants (Jason & Evelyn) demonstrated a decrease in neutral breathing patterns from baseline to both Condition 1 and Condition 2. Sophie demonstrated an increase in neutral breathing patterns in both conditions as compared to baseline. While Mary demonstrated a decrease from baseline in neutral breathing patterns during Condition 1, she demonstrated an increase in neutral breathing patterns between baseline and Condition 2.

Two participants (Sophie and Evelyn) demonstrated an increase in total words written from baseline to both Condition 1-Chromebook and Condition 2-Texthelp Read and Write. One participant (Mary) demonstrated an increase in total words written during Condition 1, but a decrease from baseline for total words written in Condition 2. Jason demonstrated a decrease from baseline in total words written during both conditions. Three participants (Sophie, Mary & Evelyn) demonstrated an increase in correct word sequences written in Condition 1, while Jason demonstrated only a slight decrease in this condition. Interestingly, three participants (Sophie, Jason, & Evelyn)
demonstrated an increase in correct word sequences in Condition 2, while Mary’s correct word sequences decreased significantly during this condition.

**Discussion**

The purpose of this pilot study was to investigate the effectiveness of two technology-based writing interventions on the reduction of anxiety in individuals with Emotional and/or Behavioral disorders. This purpose was met by 1) observing anxiety-related behaviors of participants during baseline and during sessions in which participants were given access to two writing interventions (Chromebook and Texthelp Read and Write), 2) recording participants’ breathing patterns, indicated on the Spire device app, for calm, tense, focused, and neutral respiration, and 3) comparing participants’ anxiety-related behaviors across baseline and both conditions. Additionally, this study was established to determine the rate of improvement that both technology-based writing interventions produced with regards to students’ Total Words Written and Correct Word Sequences as well as with their anxiety levels. This purpose was met by 1) collecting writing samples from participants for all baseline and condition sessions in attendance, 2) scoring participants’ total words written and correct word sequences on all writing samples, and 3) comparing changes in participants’ output of both total words written and correct word sequences from baseline through Condition 1 (Chromebooks) and Condition 2 (Texthelp Read and Write).

Results of this study indicated an interesting contrast in how the students reacted to utilizing either Condition 1 or Condition 2 with regards to breathing patterns. While
one student showed no indication of tense breathing patterns throughout the study, two students displayed an increase in tense breathing patterns during implementation of both Condition 1 and Condition 2. A fourth student demonstrated a minimal increase in tense breathing only during Condition 2. During the initial baseline session, one student stated that she was upset and nervous, due to the requirement of writing with pencil and paper, as opposed to typing, it was then interesting to note that according to the biomarker data, this student did not indicate any incidence of tense notifications. This information leads one to wonder whether the behavior has been learned by the student to be expected, or whether it is a physiological response.

It was also interesting to view the results of this study with regards to writing output. This is of particular interest, as two of the four participants demonstrated an increase in both total words written and correct word sequences upon implementation of both conditions. One participant conversely demonstrated a decrease in correct word sequences upon implementation of the conditions. It must be noted, however, that other variables may have impacted the writing task results. One such important factor was the writing tasks being assigned to the participants. All of the writing prompts the students received revolved around a History of Rock and Roll unit the entire class was also covering. Depending on the subject of the prompt, a student’s interest may be piqued, which could cause them to become more invested in writing a longer response. Due to results of this research, three additional lesson plans have been provided as Figure 22, 23, and 24. Lesson Plan Example 1, shown in Figure 22 provides a tutorial for students in how to utilize Texthelp Read and Write, and provides a writing sample for students to use in the process. Lesson Plan Example 2, and Lesson Plan Example 3, instruct students to
perform a writing task from a provided prompt using one of the Texthelp Read and Write features.

When reviewing the participants’ breathing patterns, a degree of variability was observed across sessions with the implementation of the usage of Chromebooks and/or Texthelp Read and Write software. Further research may reveal whether this variability is in correlation with the interventions, or due to other factors. While some participants demonstrated an increase in total words written and correct word sequences during Condition 1 and Condition 2, more research is needed to further support these findings.

<Insert Figure 22>
<Insert Figure 23>
<Insert Figure 24>

Limitations

Although this study is a preliminary investigation in an area with limited research, many important limitations should be noted. One such limitation is the location in which the students carried out their writing tasks. As the students were given access to utilize a software with a speech-to-text feature, it became apparent that the participants were hesitant to use this feature in a classroom surrounded by their peers. Due to this consideration, it was decided to have the participants perform their writing tasks in a separate location, an empty conference room on site. While students were observed in their classroom for the five minutes preceding the writing task, and five minutes after returning to the classroom, the observations made during the writing task were not made in the typical setting. Another limitation to consider is the fact that the students were
made available the appropriate interventions on the scheduled days, either Chromebook or Texthelp Read and Write, however, not all students chose to utilize the Texthelp Read and Write software during all of the days the intervention was available to them. Finally, due to the research being conducted during a summer school term, the time allowed to conduct the research for this project was limited. Only five sessions of each intervention were conducted, additionally, each participant missed an intervention session, limiting the data collected on either Condition 1 or Condition 2 for that session. Further studies conducted over a more extensive time frame may provide more conclusive results than those collected through this study.

Implications for Future Research

Research being done on the utilization of wearable biomarker devices and their effectiveness at addressing anxiety-related problems is in a formative stage. Wearable biomarker devices can be used in many ways for interventions in addition to behavioral assessments. Research regarding the effectiveness of language arts assistive technology applications, such as Texthelp Read and Write in either decreasing anxiety and/or increasing writing output is also in a formative stage. Further research is needed in both the realm of biomarker effectiveness and assistive technology writing supports. In this study, participants wore Spire devices during five-minutes lecture time in the general classroom, ten minutes of writing utilizing either a Chromebook or Texthelp Read and Write in a conference room, and five minutes of general classroom activities. Future research should investigate the implication of students utilizing both Chromebook and Texthelp Read and Write while being monitored with the Spire Stones in the classroom.
for the entirety of the session. By observing students in their classroom environment, the variable of performing tasks in an unfamiliar setting can be avoided and breathing patterns may reflect less tense notifications. It may be beneficial to conduct future research over a longer period of time, allowing more time for baseline, and both conditions. By conducting research for a greater length of time, a more comprehensive scope of data can be collected, and the occasional absence of a participant will be less detrimental to the effectiveness of the overall results of the study.

References


*How the Common Core Works Series.* [www.interventioncentral.org](http://www.interventioncentral.org)
Table 1.

*Participant Information*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Anxiety-Related Behavior</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sophie</td>
<td>16</td>
<td>rigid thinking, unable to engage in non-preferred activities, does not follow directions,</td>
<td>Bipolar Disorder, Generalized Anxiety</td>
</tr>
<tr>
<td></td>
<td></td>
<td>raised voice volume, pacing, difficulty shifting from preferred to non-preferred activities/topics, verbally impulsive</td>
<td>Disorder, Fetal Alcohol Syndrome</td>
</tr>
<tr>
<td>Jason</td>
<td>15</td>
<td>head down, averts eye contact, short responses to questions, slow to follow directions,</td>
<td>ADHD, Generalized Anxiety Disorder,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>requires increased prompts</td>
<td>Specific Learning Disabilities</td>
</tr>
<tr>
<td>Mary</td>
<td>17</td>
<td>raised volume of voice, leaves classroom, pacing, tearful, shakes, engages in disruptive</td>
<td>Generalized Anxiety Disorder, Major</td>
</tr>
<tr>
<td></td>
<td></td>
<td>behaviors (calls home), threatens to leave building, averts eye contact, difficulty</td>
<td>Depressive Disorder, ADHD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>transitioning from preferred to non-preferred activities/topics</td>
<td></td>
</tr>
<tr>
<td>Evelyn</td>
<td>17</td>
<td>head down, averts eye contact, short responses to questions, slow to follow directions,</td>
<td>PTSD, ADHD, Major Depressive Disorder,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tearful, shaking, leaves classroom</td>
<td>Generalized Anxiety Disorder, Binge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eating Disorder</td>
</tr>
</tbody>
</table>
Figure 1. Spire Stone (left); Real-time breath-wave and classification of breathing pattern on home screen (right).
Figure 2. Samsung Chromebook 3 used for Condition 1 and Condition 2
Figure 3. Texthelp Read and Write Talk & Type feature as shown in the instructional tutorial.

Figure 4. Texthelp Read and Write Picture Dictionary feature as shown in the instructional tutorial.
Figure 5. Texthelp Read and Write Prediction feature as shown in the instructional tutorial.

Figure 6. Percentage of intervals in which Sophie engaged in Calm (left) and Neutral (right) breathing patterns during Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.
Figure 7. Mean percentage of intervals in which Sophie’s breathing patterns were Calm, Tense, Neutral and Focused across Baseline, Chromebook (Condition 1) and Texthelp Read and Write (Condition 2) sessions.

Figure 8. Total Number of Words written by Sophie across Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.
Figure 9. Correct Word Sequences performed by Sophie across Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.

Figure 10. Percentage of intervals in which Jason engaged in Calm (top left), Tense (top right),
Focused (bottom left), and Neutral (bottom right) breathing patterns during Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.

*Figure 11.* Mean percentage of intervals in which Jason’s breathing patterns were Calm, Tense, Neutral and Focused across Baseline, Chromebook (Condition 1) and Texthelp Read and Write (Condition 2) sessions.

*Figure 12.* Total Number of Words written by Jason across Baseline,
Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.

*Figure 13.* Correct Word Sequences performed by Jason across Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.
Figure 14. Percentage of intervals in which Mary engaged in Calm (top left), Tense (top right), Focused (bottom left), and Neutral (bottom right) breathing patterns during Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.

Figure 15. Mean percentage of intervals in which Mary’s breathing patterns were
Calm, Tense, Neutral and Focused across Baseline, Chromebook (Condition 1) and Texthelp Read and Write (Condition 2) sessions.

**Figure 16.** Total Number of Words written by Mary across Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.

**Figure 17.** Correct Word Sequences performed by Mary across
Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.

Figure 18. Percentage of intervals in which Evelyn engaged in Calm (top left), Tense (top right), Focused (bottom left), and Neutral (bottom right) breathing patterns during Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.
Figure 19. Mean percentage of intervals in which Evelyn’s breathing patterns were Calm, Tense, Neutral and Focused across Baseline, Chromebook (Condition 1) and Texthelp Read and Write (Condition 2) sessions.

Figure 20. Total Number of Words written by Evelyn across Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2)
Figure 21. Correct Word Sequences performed by Evelyn across Baseline, Chromebook (Condition 1), and Texthelp Read and Write (Condition 2) sessions.
**Figure 22. Lesson Plan Example 1:**

<table>
<thead>
<tr>
<th>Teacher:</th>
<th>Date:</th>
<th>Grade: 9-12</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Number of Students:</td>
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</table>

<table>
<thead>
<tr>
<th>Unit Title:</th>
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<table>
<thead>
<tr>
<th>Lesson Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning how Texthelp Read and Write can help with our writing.</td>
</tr>
</tbody>
</table>

**Present Level of Performance (and how measured)**

Students will be assessed based on a current writing sample. The writing sample will be scored for Total Words Written and Correct Word Sequences to measure present level of performance.

**Long Term Objective (IEP goal, Learning Standard):**

CCSS.ELA-LITERACY.W.11-12.5

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1-3 up to and including grades 11-12 [here](#).)

**Lesson Objective (expected learner outcomes)**

1. Given written instructions, a video tutorial, and a writing prompt, students will type the sample paragraph into Google Documents using Texthelp Read and Write predictor, talk to type and text to speech features as instructed.

**Assessment of Lesson Objectives (procedures and criteria)**

Assessment will be done through scoring of accuracy and completion of students' typed paragraph. Additionally, anecdotal records will be noted as to whether students were properly utilizing the Texthelp Read and Write features as instructed.

**Accommodations for Specific Student Needs**

1. Students may require extended time to complete typing task.

**Materials/Resources Needed:**

- Texthelp Read and Write Tutorial Video
- Student Chromebooks
- Student Headphones
2. Students may require separate location to complete typing task.

Paragraph Typing Sample on paper
- Texthelp Read and Write Software

<table>
<thead>
<tr>
<th>Procedures</th>
</tr>
</thead>
</table>
| **Name and Define the Skill:**
Good morning class. Today we are going to learn about a tool that can help us with our writing. The tool is called Texthelp Read and Write. This software has many features to help us write more, or with more detail, and we are going to watch a tutorial and get a chance to work with the software today.

**Procedures to Introduce Texthelp Read and Write Tutorial:**
Before we do any writing, we are going to watch a short video that will show us how to use Texthelp Read and Write. I want you to open up your Chromebooks and listen to my instructions. Once you have your Chromebooks opened, you should see your Google drive account. In your Google Drive is a file labeled “Texthelp Read and Write Tutorial”. Go ahead and put on your headphones, then click on the tutorial and watch the short video.

**Procedures to Demonstrate and Model utilizing the Texthelp Read and Write app:**
The students will watch a short video tutorial (5:52) explaining how to open a Google Document, then click on the Texthelp Read and Write icon to access the drop-down menu to access features such as Talk & Type, Picture Dictionary, Prediction, and Read Aloud. The purpose of each feature is explained, and then modeled in the tutorial video.

**Procedures to Practice Texthelp Read and Write app:**
Okay, now that we have finished watching our Texthelp Read and Write tutorial, I want you to open the Google writing folder dated for the today. Once you have the document open, click on the Texthelp Read and Write icon to open the drop-down menu for the application. In the document, you should see a sample paragraph. Click on the Talk and Type icon by and practice using it by reading a sentence from the sample paragraph. Okay, if you have finished your reading your sentence, then please use the Picture Dictionary icon. You start by highlighting a word in the sample paragraph to determine the meaning of that word. Okay, if you have finished using the Picture Dictionary, I’d like you to use the Prediction icon to write the next sentence in the sample paragraph. Finally, go ahead and click on the read aloud feature after
highlighting the second paragraph. Listen to the paragraph while the Texthelp Read and Write application reads it to you.

Lesson Closure/Wrap Up
I like how you watched your tutorial and then worked so hard to figure out all of the features of the Texthelp Read and Write software. Do you have any questions? Tomorrow, you will get a chance to write your own text using one of the Texthelp Read and Write features. Thanks for all your hard work. You can put your Chromebooks away and return to class.
### Figure 23. Lesson Plan Example 2:

<table>
<thead>
<tr>
<th>Teacher:</th>
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<th>Lesson Title:</th>
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<tr>
<td>Learning how Texthelp Read and Write can help with our writing.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Present Level of Performance (and how measured)</th>
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<tbody>
<tr>
<td>Students will be assessed based on a current writing sample. The writing sample will be scored for Total Words Written and Correct Word Sequences to measure present level of performance.</td>
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</table>

<table>
<thead>
<tr>
<th>Long Term Objective (IEP goal, Learning Standard):</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCSS.ELA-LITERACY.W.11-12.5</td>
</tr>
<tr>
<td>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1-3 up to and including grades 11-12 <a href="#">here</a>.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lesson Objective (expected learner outcomes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Given written instructions, and a writing prompt, students will type a three paragraph response into Google Documents using Texthelp Read and Write talk to type features as instructed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment of Lesson Objectives (procedures and criteria)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment will be done through scoring of accuracy and completion of students’ typed paragraph. Additionally, anecdotal records will be noted as to whether students were properly utilizing the Texthelp Read and Write features as instructed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accommodations for Specific Student Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Students may require extended time to complete typing task.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Resources Needed:</th>
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<tbody>
<tr>
<td>- Student Chromebooks</td>
</tr>
<tr>
<td>- Student Headphones</td>
</tr>
<tr>
<td>- Writing Prompt</td>
</tr>
<tr>
<td>- Texthelp Read and Write Software</td>
</tr>
</tbody>
</table>
2. Students may require separate location to complete typing task.

Procedures

Name and Define the Skill:
Good morning class. Yesterday we learned about a tool that can help us with our writing. The tool is called Texthelp Read and Write. Texthelp Read and Write has many features to help us write more, or with more detail, and we are going to use one of the specific features, Talk to Text to help us in our writing today.

Procedures to Introduce Texthelp Read and Write Lesson:
Before we do any writing, let’s talk about Texthelp Read and Write. What were some of the features we worked with during our practice yesterday? (Guide students to state “Picture Dictionary, Prediction, Talk and Type, and Read Aloud). We are going to write our text without actually writing. Does anyone know which feature we will be using to do that? (Guide students to state “Talk and Type”). Yes, we will be using the Talk and Type feature.

Procedures to Demonstrate and Model utilizing the Texthelp Read and Write app:
The teacher will project her computer screen so students can watch her model these steps. The first thing I need to do is open my Google writing folder with today’s date (click to open appropriate folder). Now that I am in here, I can see my writing prompt listed at the top of the page. The prompt provided is regarding the newspaper article we just read in class regarding the advantages and disadvantages of technology and its effects on your generation. The writing prompt is as follows: “In recent news articles there has been some debate whether access and use of technology is causing positive or negative effects on youth in America. Write a response stating whether you believe technology is advantageous or disadvantageous to your generation. Provide supporting statements as to your reasoning.” I am thinking about this prompt and how I feel about this. I want to make sure my cursor is down below the writing prompt paragraph. I think there are advantages to using technology, so I am going to argue for that side of the debate. I need to put on my headphones so I can talk into the microphone and I click on the Talk and Type icon at the top of the page. (Click on icon and begin speaking). “I believe that there are many advantages to teenagers using technology.” (Make sure students can see the screen showing the words appearing in the document.). “One benefit to the youth of America having access to technology is that they are more aware of current EVENT.”
(Say event as a singular to allow for students to see that mistakes can be fixed). I see that I said event instead of events. I am going to use my mouse to click on event and add the “s” to the end to correct.

**Procedures to Practice Texthelp Read and Write Talk and Text feature:**

Now that you have had a chance to see me use the Talk and Type feature, let’s do a sentence together. Go ahead and open your Google Doc folder with today’s date. You should see the writing prompt I mentioned at the top of the page. Read the prompt silently, and then I want you to place your cursor down below the prompt. Now that the cursor is in the correct spot, what should we do next? (Call on student and guide them to stating “put on headphones”, then “click on talk & type icon”). That’s right, we put on our headphones, then we click on the talk and type icon. It is very important to know that once we click on the talk and type icon, the computer will be ready to write down what we say, so if you need to think about what you want it to type first, that is just fine. In fact, let’s take a minute and think about what we want to write, which side of the debate do we agree with more, is technology good for our youth, or not good? (Give students a moment to think about their response). Now we get to use our new tool. Click on the talk and type and let’s begin this sentence together. “Technology definitely effects the youth in the United States greatly. I believe that technology is…“. Okay this is where you state which side you agree with, so you will either say “...technology is beneficial (positive, a good thing, etc.)” or “technology is disadvantageous (negatively effecting, bad, etc.). Once you have your opening statement typed, I want you to think of two supporting details that help support your viewpoint. Then, use the talk and type feature to write those supporting sentences. You should be able to write at least three paragraphs with your “argument”, and supporting information. Make sure to use your cursor, and to click to correct or change your writing if you make a mistake.

**Lesson Closure/Wrap Up**
Nice job using the Talk and Text feature, everyone. I noticed a few people making corrections, or simply thinking about how they want to say their writing response, that is awesome. Do you have any questions? Tomorrow, you will get a chance to work with another one of the Texthelp Read and Write features. Thank you for working so hard. You can put your Chromebooks away and return to class.
**Figure 24. Lesson Example 3:**

<table>
<thead>
<tr>
<th>Teacher:</th>
<th>Date:</th>
<th>Grade: 9-12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number of Students:</td>
</tr>
</tbody>
</table>

**Unit Title:**

**Lesson Title:**
Learning how Texthelp Read and Write can help with our writing.

**Present Level of Performance** (and how measured)

Students will be assessed based on a current writing sample. The writing sample will be scored for Total Words Written and Correct Word Sequences to measure present level of performance.

**Long Term Objective** (IEP goal, Learning Standard):
CCSS.ELA-LITERACY.W.11-12.5

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1-3 up to and including grades 11-12 [here](#)).

**Lesson Objective** (expected learner outcomes)

1. Given written instructions, and a writing prompt, students will type the a three paragraph response into Google Documents using Texthelp Read and Write predictor feature as instructed.

**Assessment of Lesson Objectives** (procedures and criteria)

Assessment will be done through scoring of accuracy and completion of students' typed paragraph. Additionally, anecdotal records will be noted as to whether students were properly utilizing the Texthelp Read and Write features as instructed.

**Accommodations for Specific Student Needs**

1. Students may require extended time to complete typing task.

**Materials/Resources Needed:**
- Student Chromebooks
- Student Headphones
- Writing Prompt
2. Students may require separate location to complete typing task.

- Texthelp Read and Write Software
- Projector/screen

<table>
<thead>
<tr>
<th>Procedures</th>
</tr>
</thead>
</table>
| **Name and Define the Skill:**
Good morning everyone. Yesterday we worked with a specific feature of Texthelp Read and Write, the Talk to Text feature. Texthelp Read and Write has many features to help us write more, or with more detail, and we are going to use a different feature, Predictor, to help us in our writing today. |
| **Procedures to Introduce Texthelp Read and Write Lesson:**
Before we do any writing, let's talk about Texthelp Read and Write. What did it feel like to use the Talk to Text feature yesterday? (Allow students to answer). We are going to write our going to use the Predictor feature today. Does anyone remember how the prediction feature works, or how it can help us in our writing? (Guide students to state benefits to predictor: coming up with words or ideas). Exactly, the Predictor feature can help us write when we are stumped on what to type next, or it may just make it easier to get our words into the document because it gives us the option before we even type it. |
| **Procedures to Demonstrate and Model utilizing the Texthelp Read and Write app.:**
The teacher will project her computer screen so students can watch her model these steps. The first thing I need to do is open my Google writing folder with today's date (click to open appropriate folder). Now that I am in my document, I can see my writing prompt listed at the top of the page. The prompt provided has to do with the technology prompt we worked with yesterday, but this time you get to write in a more narrative style. We have been discussing whether technology has had more of a positive or negative impact on your generation. Today, you get to write about a time in your life when technology has directly impacted you. The writing prompt is as follows: “In class we have been discussing the impact technology has on your generation. Using the Texthelp Read and Write prediction feature, write a three paragraph response telling about a time in your life when technology has had an impact on you. The impact can be positive or negative, or you may compare and contrast two different situations.” Let me think about how I want to respond. First, I want to make sure my cursor is down below the writing prompt paragraph. I remember a time that my husband was supposed to pick me up from work, but he got sucked into a video game and was very late. That definitely was an example of technology having a negative impact on my life. |
I don’t need to put on my headphones today, so I’ll leave those aside. I am going to begin typing, “One time that technology had a negative…” I am going to click on my predictor icon to help me find the best word here. (Click on prediction icon). I see that effect is one of the choices, I like how that sounds, so I will select effect. I will continue to use the prediction feature for the remainder of my response.

Procedures to Practice Texthelp Read and Write Talk and Text feature:

Now that you have had a chance to see me use the Prediction feature, let’s do a sentence together. Go ahead and open your Google Doc folder with today’s date. You should see the writing prompt I mentioned at the top of the page. Read the prompt silently, and then I want you to place your cursor down below the prompt. Now that the cursor is in the correct spot, what should we do next? (Call on student and guide them to stating “Click on Prediction icon”). That’s good, we can click on the prediction icon before we start typing, or after we have begun. Don’t forget to take a minute and think about what we want to write, are you going to write about a time when technology helped in your life, or when it caused problems? Perhaps you want to write about and compare both types of situations? Now we get to use our new tool. Click on the Prediction icon and let’s begin this sentence together. “Technology has had an impact on my life in a… “. Okay this is where you can use the prediction feature to help continue in your writing. Perhaps you want to select good, or positive? Or maybe you want to choose negative, or bad? The choice is yours. Once you have your opening statement typed, I want you to elaborate on the situation, and how technology affected you. You should have at least three paragraphs when you are done. Make sure you are using that prediction feature to help you and let me know if have any questions.

Lesson Closure/Wrap Up
Nice job using the Prediction feature, everyone. I noticed people thinking about how they want to say their writing response, and clicking on choices given by the prediction feature, great job using your tools. Do you have any questions? Thank you for working so hard today. You may put your Chromebooks away and return to class.