

Effective Technology Supported Writing Strategies for Learners with Disabilities

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## **Abstract**

Recent literature has shown the positive impact supporting writing instruction with technology for students who struggle with writing, including those with intellectual and developmental disabilities (ID and DD). Based on a yearlong study involving general and special education teachers serving students in inclusive classrooms, we identified specific learning strategies that, when supported with efficient and effective technology, enhance writing outcomes for students with and without disabilities in inclusive settings. To facilitate data collection and assist teachers in identifying needed strategies and technology tools, we integrated a progress monitoring tool. With teachers collecting periodic data on class-wide writing progress, instructors were able to offer more responsive instruction to meet the individualized needs of each learner, including those with ID and DD. These outcomes align with the recent AAIDD/ARC joint position statement promoting placement in the least restrictive environment, high expectations for all learners, academic integration into general education, the utilization of the Universal Design for Learning framework in designing curriculum and instructional supports, the use of evidence-based practices, increased student participation, and appropriate use of technology. Results of this yearlong study are shared and recommendations for inclusive writing instruction are provided.

**Keywords:** writing, strategies, technology application, progress monitoring, technology intervention

## **Effective Technology Supported Writing Strategies for Learners with Disabilities**

### **Introduction**

The United States Department of Education (USDOE) released its annual report in 2018 demonstrating that students with disabilities are increasingly included in general education settings for all or most of their day. A steady upward trend towards more inclusive services has been documented since 2007 (USDOE, 2018). According to the 40<sup>th</sup> Annual Report to Congress, 81.4% of students with disabilities were served in general education classrooms 40% or more of their day in 2018. At 43.3%, students with Intellectual Disability (ID) were served in general education less than every other disability group except for those students with multiple disabilities (30.5%). Students with ID are served in general education less than 40% of their day at a rate of 49.4%. They are served in other environments (residential, private, hospital/homebound, correctional, or separate school) at a rate of 7.3%. These service numbers from the USDOE (2018) demonstrate the majority of students with ID have access to public schools and, according to the Individuals with Disabilities Education Act (IDEA, 2004), to the general education curriculum provided within these schools. However, access to public school does not always equate to outcomes that support the highest expectations of achievement for these students (Polloway, Bouck, & Yang, 2019).

To address the needs of students with ID served in general education settings, the American Association on Intellectual and Developmental Disabilities (AAIDD) and the Arc of the United States (ARC) adopted a joint position statement on education in 2018. This position statement emphasizes the need for “high quality instruction and access to the general education curriculum in age-appropriate inclusive settings” (p.1). The statement goes on to highlight the following:

*Administrators, educators, and support staff too often lack sufficient training and knowledge about the legal rights, learning needs, and abilities of these students...*

*Outdated, inaccurate beliefs about students with IDD persist, leading to low expectations, segregated classrooms, inappropriate disciplinary practices, and diminished accountability for these students. (AAIDD & The Arc, 2018)*

To address these issues, the AAIDD/ARC position statement calls for increased adherence to IDEA through the following mandates:

- *Ensure that all students have access to the general education curriculum. General education includes academic curriculum, extracurricular activities, and other school activities.*
- *Incorporate evidence-based, peer-reviewed instructional strategies and interventions, provided by professionally qualified teachers, related services personnel, and other staff, all of whom receive the training, preparation, and supports they need to be effective professionals.*
- *Ensure that a range of appropriate technology options are made available in a timely and culturally and linguistically appropriate manner to all students who could benefit from them, and that the necessary training for use of the technology is provided immediately and consistently (AAIDD & The Arc, 2018).*

One approach to address this call for purposeful action is for the educational community to include the needs of individuals with ID in their professional developments, curricular trainings, outcome measures, school improvement, resource, and support plans. According to IDEA (2004), individuals with ID should be able to access, participate, and make progress in the general education curriculum. Students with ID increasingly receive some of their services within the general education curriculum (USDOE, 2018). Therefore, it is important to provide

interventions within the general education setting and content areas that address the needs of individuals with ID as well as other students within those settings. The purpose of this study aligns with the aims of the AAIDD/ARC position statement by including individuals with ID in intervention work conducted in the general education classroom. Specifically, this study features the integration of an effective writing strategy with proven technology tools to improve writing outcomes.

### **Writing**

Writing is an essential skill for students with ID (Ratz & Lenhard, 2013), particularly a skill required within the demands of the inclusionary classroom. However, instruction in writing for students with ID has not been heavily studied in the last 10 years (Joseph & Konrad, 2009; Pennington, Delano, & Scott, 2014; Pennington, Welch, & Scott, 2014). Few studies target specific strategies designed to support the attainment of writing skills for this population. Although literacy is repeatedly named as an area of focus in policy regulations such as Individuals with Disabilities Education Act (IDEA) 2004, Every Student Succeeds Act (ESSA) 2015, etc., the focus of these policies has predominately been on reading. Writing, however, is a key component of literacy (Ratz & Lenhard, 2013), and high-quality writing instruction is garnering increased attention, as evidenced by the inclusion of a detailed writing framework in the statewide literacy plans of several states, including Oregon (Oregon Department of Education, n.d.). An additional way states address writing is through the application of the Universal Design for Learning framework, a framework encouraged by ESSA (2015). Universal Design for Learning emphasizes the need for multiple means of action and expression and allowing students to share what they know through many avenues. However, text-based writing continues to be the default method for most educators.

In 2009, Joseph and Konrad published a review of the literature on effective methods for teaching writing to students with ID. Eight studies addressed effective methods for teaching writing to students with ID resulting from this systematic literature review spanning 20 years (1986–2007). Researchers' findings concluded that individuals with ID benefitted from writing instruction, with specific strategy instruction yielding the strongest outcomes for students with ID. Researchers recommended that writing instruction be embedded into the daily curriculum of individuals with ID and supported through appropriate accommodations and technology. An additional recommendation was that students' progress be monitored regularly to evaluate adequate gains, additional needs for instruction, and whether the type and amount of instruction meets student needs.

Since the Joseph and Konrad study of 2009, little has changed in the research on writing instruction and individuals with ID. We identified a limited number of works that focused on students with ID and writing instruction. Pennington, Delano, and Scott (2014), developed an intervention consisting of modeling, self-monitoring, prompting, and feedback to improve the letter writing skills of three individuals with ID. All three participants showed improvement in their ability to write a letter. An additional study by Pennington, Welch, and Scott (2014), demonstrated the implementation of a multi-component package (i.e., a robot, simultaneous prompting) to teach three adults with ID text messaging skills. All three participants showed improvement and generalized those new skills to different texting partners.

Continuing work on writing strategies, Cannella-Malone, Konrad, and Pennington (2015) describe the ACCESS! Strategy to teaching writing skills to students with ID. Cannella-Malone and colleagues define ACCESS! as accommodations and assistive technologies, concrete topics,

critical skills, explicit instruction, strategy instruction, and systematic evaluation. Tips and tools for each support are offered.

Although predominately focused on reading, Forts and Luckasson (2011) detailed the experience of a student's journey with literacy and discussed how the skills used in literacy-rich environments maintained and supported the student's relationships with family and friends. Finally, two additional literature reviews were offered since 2009. Knight, Browder, Agnello, and Lee (2010) provide a general review of recommended procedures to utilize with individuals with severe disabilities across all academic content instruction. This includes two paragraphs on writing instruction highlighting a dissertation demonstrating effective strategy use. A second review by Erickson, Hatch, and Clendon (2010) examines literacy instruction supported with assistive technology for students with significant intellectual disability. Erickson and colleagues present information on the greater context of literacy, the application of literacy instruction with this population, the use of assistive technology to support this instruction, and specific suggestions and/or recommendations for how to best address the needs of these students in literacy instruction with proven strategies and technologies.

In all, seven new publications were identified that included individuals with ID and writing. Writing is a critical skill to increase literacy (Graham and Hebert, 2010). It is often overlooked as a functional way to increase comprehension, communication, and learning skills such as analyzing, personalizing, recording, and connecting key ideas (Graham and Hebert, 2010). While limited studies have addressed the instruction of writing for students with ID, the reliance on writing for communicating knowledge in general education classrooms and the successful application of writing interventions with students with ID underscores the need for

additional study of writing instruction in inclusive settings. Such study directly addresses the mandates supplied by the AAIDD/ARC Position Statement (2018).

### **Purpose of the Study**

Based on the need for inclusive writing intervention for all students, including students with ID who have been historically limited in their access to the general education classroom and curriculum, we sought to deliver high-quality writing instruction aligned with integrated technology in an inclusive general education classroom. We designed the current study to examine the impact of an effective writing strategy combined with technology tools on class-wide student writing outcomes. Specifically, we used the self-regulated strategy development approach (SRSD) with two technology tools (word prediction and interactive graphic organizer) across general education English language arts classrooms to evaluate student growth across the academic year. We were particularly interested in determining: (1) the impact of the intervention combined with technology and student writing outcomes as it affected students who struggle and their peers with disabilities, including those with ID and (2) the manner in which the writing intervention and the technology tools were combined by teachers to facilitate writing development in an inclusionary classroom.

### **Methods**

We conducted a yearlong analysis of student writing through a digital-based progress monitoring tool analyzing student performance across three specific calendar points (fall, winter, and spring). We targeted a diverse population of struggling middle school students receiving writing instruction through their language arts or social studies classes. The primary focus was to determine if the implementation of specific writing strategies coupled with technology supports resulted in increased writing achievement. Twice monthly, all students were automatically



scored on three primary components of writing with analysis considering student growth across the academic year. Accompanying the twice monthly progress monitoring assessments, Instructional Coaches working with teacher participants recorded narrative summaries of observed teacher efforts to implement writing strategies and technology tools with students with identified disabilities. Our analysis conformed to data use agreements and university human subjects regulations.

### **Setting**

Our progress monitoring (PM) process is geared toward identifying and intervening with struggling middle school students. As a result of that intention, we looked for buildings that met the following criteria: a population of students with disabilities (SWDs) above the district average; and buildings with an identified number of students who, due to socioeconomic status, home experiences, learning challenges, or other factors, had been determined to be at risk for school failure. While not an initial criterion, the site selected for this study also included a large population of English Learners (ELs).

We selected a midwestern middle school located in an urban/suburban setting that fit the above criteria. The district had nine middle schools that fed into five corresponding high schools. Each middle school averaged between 750 and 900 students. Invitations were sent to middle schools, followed by presentations with district and building leadership to recruit interest in participation. The school selected from this district-wide recruitment had a total enrollment of 736 students with 53% of enrolled students coming from economically disadvantaged households and 46% receiving free and reduced lunches. The racial and ethnic makeup of the student population was as follows: 57% white, 11% African American, 25% Hispanic, and 7% “other” ethnicity. Approximately 13% of students were classified as ELs and just over 14% were

students with disabilities (SWDs) being served with an Individualized Education Program (IEP). While the service delivery model was dependent upon the specific needs of the child, all children were included in language arts and social studies classes.

Writing was already offered as a portion of the school day. Both the school and district focused on trying to provide additional writing time for students. The expectation was that writing instruction would take place at least twice per week for 20 minutes a day. The remaining time was spent on reading instruction in the language arts setting and social studies instruction in the social studies classroom. All students had access to a laptop or iPad that was connected to the Internet. All devices had installed an interactive graphic organizer program, a word predication program, and text-to-speech supports. For student privacy and limited interruption, students used individual headsets.

### **Participants**

From the selected middle school, three sixth-grade general education teachers participated in the study. Two teachers taught five sections of language arts (LA), and the third taught three sections of LA and two classes of sixth-grade social studies. All three were male teachers. The two LA teachers had taught for seven and two years. The social studies teacher was a fourteen-year veteran. A female special education teacher served as a case manager for the sixth-grade students with an identified disability; however, she did not provide writing instruction and, thus, was not part of this study. Students with disabilities were included in the general education classroom for writing and, thus, in the study, were from the following disability groups: Learning Disabilities, Other Health Impaired, Attention Deficit Hyperactivity Disorder, Emotional Behavior Disorder, Intellectual Disability, and Autism.

Student participants included all students enrolled in the middle school LA classrooms. Student participants represented various social, economic, ethnic, and educational backgrounds, as presented in the setting description. Of the 254 students, 52% were female and 49% were male. Thirty-nine of the students had an identified disability and an associated IEP. An additional 36 students received EL services (see Table 1)

<Insert Table 1 Here>

### **Procedure Intervention**

***Teacher training.*** Teachers participated in two half-day summer professional learning experiences. The summer training (a) sought to facilitate an introduction to the SRSD instructional approach and Inspiration and Co:Writer, (b) began to foster teacher planning for their implementation, and (c) created coordinated calendars with teacher and district schedules to avoid potential conflicts that had often been found prior to the beginning of the academic year. Two brief, 45-minute after-school refreshers were provided during the first two weeks of school. After the second week of school, two Instructional Coaches were assigned to work with the four teachers to facilitate further understanding, application, and student implementation of the strategies and technology tools.

***Technology tools.*** The technology intervention focused on two specific applications: (1) Inspiration, and (2) Co:Writer. Inspiration is an interactive graphic organizer that includes the following elements: 1) color or patterned symbols/objects/shapes, 2) audio output including text-to-speech, 3) ability to convert the digital web to an outline, 4) ability to connect symbols, text, and/or the general ideas to create a web, and 5) ability to embed images, graphics, videos, and similar visuals across the various parts of the interactive graphic organizer. Inspiration is available via a laptop and mobile devices (e.g., iPad). Teachers and students were trained in the

basic operations of the program (e.g., the How To functions) as well as ways to integrate Inspiration with a specific SRSD strategy that is noted below.

Teachers were also introduced to the direct use of word prediction through the Co:Writer application. Co:Writer is available on laptops and digital devices and includes: 1) a list of words to select from, 2) audio-output for each possible word, 3) ability for the program to learn from student's previous writing to enhance the words offered, 4) thorough vocabulary lists for targeted words, 5) ability to add personalized vocabulary lists, and 6) a number of other similar features that strength the flexibility and depth of the word prediction tool. Teachers and students were trained on the basic operations of Co:Writer with a direct focus on how to use to facilitate developing an initial draft.

Both technology applications were directly aligned with a specific SRSD intervention (explained below). Teachers were first introduced to the two technologies at a professional learning day at the beginning of the school year. The training featured direct instruction on the operations of the program followed by how it directly aligned to a specific SRSD strategy. Ongoing support was provided by an Instructional Coach. In-class training also included direct instruction for students, modeling of ways to combine the technology with the strategy, and supervised practice where Coaches observed and provided feedback to teachers and students on ways to further implement the technology ad SRSD intervention.

***Writing strategies.*** Our study employed the Self-Regulated Strategy Development (SRSD) approach because of the current evidence-based research supporting SRSD; the alignment of the essential steps of SRSD to current writing literature for students with IDD; and the integrated mnemonics that, with embedded visuals, have been found to be applicable to the

needs of students with and without disabilities, making them relevant to the needs of an inclusionary classroom.

SRSD is an intervention designed to improve student writing through a six-stage process that offers explicit instruction of academic strategies and self-regulation skills (Graham & Harris, 2005). Identified by the Institute of Educational Sciences' (IES) What Works Clearinghouse as an evidence-based practice (EBP) (USDOE, 2019), the SRSD practice begins as a teacher-directed approach and ends with students independently applying the strategy before writing. The primary research has involved students with learning disabilities (Graham & Harris, 2013), however, the specific steps, the modeling components, facilitated practice, and the explicit skills taught to empower the student align with current IDD research. For example, Pennington, Welch, and Scott (2014) found that consistent modeling, direct instruction for self-monitoring development, and further teacher prompting and feedback can improve the writing process for students with IDD.

SRSD has six stages that help teachers and students learn and apply the writing process. SRSD features explicit instruction in and supported development of self-regulation through all six stages: (1) development of background knowledge, (2) discuss it, (3) model it, (4) memorize it, (5) support it, and (6) establish independent practice. To further facilitate the six stages, the SRSD approach employs a series of mnemonic devices to further organize the student for the various genre of writing. The mnemonics are used to help students with intellectual disability and their peers who do not know how to express what they know in writing. These students also do not respond to abstract terms that are part of the writing process, such as "brainstorm." Instead, students with intellectual disability and their struggling peers need specific and concrete strategies to understand the sequence and necessary steps.

Two mnemonics used in our study sought to support idea generation, or brainstorming, and to facilitate writing. STOP was the first SRSD mnemonic introduced and stands for: (1) Suspend judgement, where students are asked to list the points for both sides of an argument and consider all possible ideas; (2) Take a side, where students are asked to read through the list of points for both sides and determine which side the student believes is more persuasive; (3) Organize your ideas, where students select the strongest idea; and (4) Plan more as you write, where students continue planning as they write. The TREE mnemonic was the second SRSD approach. Used for opinion or persuasive writing, TREE stands for: (1) Topic sentence; (2) Reasons; (3) Explain reasons, where a student is asked to say more about each reason; and (4) Ending, where the student is asked to wrap it up.

***Writing strategy and technology implementation.*** Two technology applications were paired with one of the two SRSD mnemonics. To facilitate brainstorming, STOP was paired with Inspiration. Likewise, TREE was paired with Co:Writer to foster sentence construction and overall fluency. Teachers participated in a late summer professional learning day where they were introduced to both the SRSD strategies, particularly STOP and TREE, and were provided the basic operations of Inspiration, Co:Writer, and the text-to-speech feature on laptops and iPad devices, which allowed students to listen to what they had written. The expectation was that teachers would implement the strategy with the technology tool. Cheat Sheets for the technology tools and the mnemonics were provided, offering step-by-step directions to facilitate application. The Cheat Sheets included step-by-step instruction as well as visuals of the SRSD approach and screen shots from the application. The Cheat Sheets were no more than three pages to offer quick reference but enough support for a level of independence.

Once the school year began, each teacher was assigned an Instructional Coach. The Instructional Coach worked with the teacher to implement the SRSD strategies and technology tools. Efforts focused on either STOP or TREE, along with the Inspiration and Co:Writer tools. Instructional Coaches worked with teachers and their students to review the basic “how-to” operations of the strategy and the tech tools. They modeled usage for both teachers and students, offered practice opportunities, provided critical feedback, and contributed additional support to facilitate use. The intent was to provide the just-in-time support teachers and students often need when working to integrate a new solution. After initial in-class support during the months of September and October, teachers and students worked independently, with sporadic support from the Instructional Coaches, to implement the strategies with the technology.

We should note, teachers continued to use previously adopted writing strategies (e.g., the Hamburger). Likewise, teachers and students used additional technology tools (e.g., text-to-speech, speech-to-text) introduced through previous district- or building-level professional learning. Our study did not prevent business-as-usual interventions but also did not support or facilitate their use.

## **Measures**

***Writing progress monitoring.*** A writing progress monitoring tool was the primary measure for our study. The WRITE Progress Monitoring tool (WPM) is a web-based tool that quantifies a student rate of writing improvement based on their responsiveness to instruction (i.e., strategy and technology instruction) and evaluates the effectiveness of the instruction. The WPM was developed specifically to assist teachers in assessing their students’ current abilities and how they progressed after instructional supports and over the course of the academic year. Teachers and students were provided scores on four areas of writing: (1) spelling, (2) sequence

or words, (3) number of words, and (4) number of letters. While normed to sixth-grade narrative standards, the tool was also designed to determine where the student stood amongst their peers and as compared to their own progress over time.

The WPM is an online progress monitoring tool for writing based on the cornerstone of writing assessments for struggling writers and those with disabilities (Troia, 2011). Working with a group of national experts in writing instruction and assessment for students with and without writing disabilities, we developed a structured progress monitoring online system. The features of the WPM include: (1) a system to load all students, (2) a bank of writing prompts for middle school genres (i.e., narrative, argumentative, persuasive), (3) timed writing sessions, (4) automatic scoring, and (5) data displays for the individual (e.g., student trend lines) as well as across students (e.g., entire class, across classes).

The quantitative scoring measures used for the computer-based samples include four commonly used categories: total letters (TL), total words written (TWW), number of words spelled correctly (WSC), and correct writing sequence (CWS). These four categories are used in quantitative Curriculum-Based Measures (CBM) scoring and can give teachers a basic understanding of which aspects of writing students find most difficult. Figure 1 offers an example of a student passage with the four scoring categories. We should note that our analysis focused on three of the four measures and did not include total letters. This was determined by study participants.

<Insert Figure 1 Here>

The WPM was developed through a series of usability and feasibility testing across sixth-grade students with and without disabilities. Writing prompts were developed by a Board of Master English Language Arts teachers and then reviewed by a panel of national experts.



Prompts were content neutral, provided at a third-grade reading level, and offered in text as well as text-to-speech. Once students log-in, they received directions (through writing and audio speech) that included a prompt and were provided three minutes to write to the prompt. They were then directed to the next page, where the prompt was provided, as well as the suggestion to consider the prompt for the next minute. After the visual timer counted down to zero, students were automatically provided a page with the prompt and an empty textbox to type. At the bottom of the textbox was a timer counting down from three minutes. Once the three minutes was up, the web page was replaced with a “thank you” page supporting the students’ effort and directing them to seek teacher direction for their next task.

To determine student outcomes, teachers were provided access to the student writing sample, individuals’ scores, and class-wide scores. Automatically scored, student data could be accessed by teachers immediately following the three-minute write. For each individual student, teachers had access to the writing product with noted errors identified (see Figure 1). Student outcomes were also graphed within a trendline, including all previous three-minute prompts. Figure 2 illustrates how class-wide data was provided in a graph identifying where students fell in the top 25%, top 50%, lowest 25% and lowest 10%. Based on teacher usability and feasibility testing, teachers requested visual graphs that identified the lowest 25% and the lowest 10% of their student writing scores. Access to this data could be viewed collectively or individually.

Working with an Instructional Coach, teachers conducted a series of data walks to be introduced to the WPM data, the various ways to see and organize individual and across class scores, and the related features. The data walks continued through the first 3–4 progress monitoring experiences (first 8–10 weeks of the academic year). By the fourth data collection point, teachers could begin to see individual trendlines to further understand student

performance. The data walks turned from conversations about student data to decision making on the SRSD and accompanying technology tool. While each coaching session sought to reinforce the need to intervene with the strategy and technology, multiple data points appeared to influence interest and classroom application. Subsequent data walks between Instructional Coaches and teachers included focusing on student outcomes and in turn identifying the appropriate SRSD approach with the aligned technology tool.

<Insert Figure 2 here>

Teachers were asked to conduct a WPM session once every two weeks across the entire academic year. Student PM sessions began within the first four weeks of school and concluded within the final four weeks of the academic year. All students in the general education setting, including students identified with disabilities, participated in and completed each WPM.

***Instructional coaching logs.*** To gain an understanding of teacher application of the strategies and technology solutions, Instructional Coaches (ICs) recorded weekly journals. These journal logs were posted via Google Docs and completed for 10 weeks in the fall semester (October, November, December) and 4 weeks in the spring semester (January, February). Although they were required to be posted weekly, they often included a collection of multiple days in a given week. ICs made note of the interactions they had with teachers and observations of teacher practice in the classroom. Notations included what was discussed, teacher need, role of the Instructional Coach (e.g., tutor, model, direct student instruction), teacher practice, student behaviors, and similar components of the teacher-coach interaction, as well as teacher and student writing and technology implementation. ICs were asked to record in a journal format what occurred and what was observed. ICs were asked to report teacher and student behavior around the following constructs: 1) technology used, 2) strategy applied, 3) strategy and

technology tool used in combination, 4) amount of time of technology and strategy implementation, and 5) degree of adoption on the part of the teacher and the student specific to the writing experience. Periodic checks on the journaling were conducted where an outside reviewer and the Instructional Coach reviewed the documented journaling. Likewise, ICs asked teachers to review journal logs to provide feedback and corrections to any errors or incomplete representations.

### **Data Analysis**

PM data was collected at three time points during the academic year including August, November, and the end of February. The academic year began the second week of August in this school district and ended in late May. Writing ability was examined using three indicators: word count, number of words spelled correctly, and a measure of correct writing sequence. Repeated measures of analysis of variance (ANOVA) was used to determine where there were any statistically significant differences between the means of the three independent progress monitoring outcomes.

Submitted journal entries were examined to inductively construct themes across the two Instructional Coaches and the teachers they supported. Two researchers independently reviewed the typed log (submitted via Google Docs) to identify initial themes. The focus of this review was to further understand strategy and technology application, particularly for struggling learners and their peers with identified disabilities. Next, the researchers met and developed consensus themes for analyzing the journal submissions. Subsequently, one researcher used the developed themes to code the remaining journal entries. As necessary, themes were revised in response to the journal entries. Next, the other researcher examined the coded journals to ensure that each

coaching log was reliably coded to a theme. Afterwards, the two researchers met again to establish consensus regarding coding journal entries into themes.

## Results

Data was collected at three time points (fall, winter, and spring) during one academic year. The first data point was collected within the first three weeks of the academic year. The final data point was collected prior to a shift in instructional focus (preparation for state examination) and the subsequent state testing (completed by the end of April) that completed the academic school year. Writing ability was assessed using three indicators: *word count*, *number of words spelled correctly*, and a measure of *correct writing sequence*. The descriptive statistics for all variables are shown in Table 2.

<Insert Table 2 here>

Repeated measures analysis of variance tested the expectation that there would be improvement on each indicator across the three time periods. Results show the three writing variable scores increased from August to November and continued between November and February. *Word Count*, Wilks' Lambda  $F(2, 509) = 79.37, p \leq .001$ , partial eta squared = .24, *Words Spelled Correctly*, Wilks' Lambda  $F(2, 509) = 87.98, p \leq .001$ , partial eta squared = .26, and *Correct Writing Sequence*, Wilks' Lambda  $F(2, 509) = 117.25, p \leq .001$ , partial eta squared = .32, all increased significantly across the three measurement times with very large effect sizes. Figure 3 offers a visual illustration of the growth in writing performance over the academic year.

<Insert Figure 3 about here>

To respond to the research questions specific to teacher and student application of the strategies and technology, particularly for students with disabilities and the perceived effect on writing, three themes were constructed based on the journal entries submitted by the ICs on level

of implementation and classroom observation: 1) student focus of strategy and technology implementation, 2) purpose and use of technology tool, and 3) student writing participation in the writing experience.

*Theme 1: Student focus of strategy and technology implementation.*

Teachers perceived the writing interventions as part of a class-wide effort. Their actions to implement the strategies with the technology tool sought to enhance the writing outcomes for all students, including those with disabilities. With that said, their specific focus targeted students with disabilities, particularly those individuals that were very low performing. From the progress monitoring perspective, this group represented the lowest 10% of the class. When considering the disability category, these students were primarily ones identified with an intellectual disability. For example, one coach shared in her log the need to provide information about students with disabilities as part of her regular support/guidance:

I struggled with understanding the research behind writing development and prompts.

There are numerous factors to consider, including development and characteristics of specific disabilities and how that can affect their processing. I spoke with these things to the teachers and other coaches.

Instructional Coaches were asked to facilitate a class-wide effort in order to implement Inspiration and/or Co:Writer and the SRSD approach. They felt a responsibility to the entire class and, from the progress monitoring data, realized patterns that suggested all students would benefit from the strategy and technology solution. Their logs continually represent this effort and also reflect teachers' efforts on the lowest 10–25% of their students. For example, the same coach shared:

...I met with Eric Tuesday, 5th hour, to discuss IEP writing goals and to discuss how to begin using Inspiration Maps and the SRSD strategies [for his students with IEPs]. After our data walk last week, Eric had selected a NEWSELA article [to alter reading levels] as the basis for a future activity where students [with IEPs] would use one of the Inspiration Map templates he selected and ultimately would write about the article using TREE or STOP DARE. Eric and I plan to meet next week to look at the templates for the lesson. This will be the first time Eric has used an Inspiration Map template and a strategy [for students with IEPs].

The second coach added:

After doing an overview of the starpaw.com data [progress monitoring system] via a pp [PowerPoint] last week, Eric and Michael requested writing conferences primarily with students who they identified were in the bottom quartile based on their short writes [including all students with IEPs]. I conferenced with Michael's students one day, hours 1–5, then finished another day with the remaining students. Likewise I conferenced with Eric's students one day hours 1–5 then did make-ups another hour. Students captured their graph/trend line via cameras on their iPad, then also photographed their writing conferences sheet to use prior to their next short write.

As coaches shared their week-to-week responsibilities, their role aligned with initial expectations (e.g., modeling, facilitating). Emphasis was working with teachers on their instructional writing goals to further effective writing opportunities and increase the quantity of student writing. Of course, the overall goal was to enhance student outcomes, but teachers continually returned to the lower 10–25% of the class. Instructional Coaches indicated that the technology and strategy would benefit the entire class; however, the teachers' emphasis on

directing instructional efforts to those in the lower portion of the class defined much of what the coaches facilitated. As one coach explained:

This week I did student writing conferences with Michael, then pulled out students from his class and Eric's class; these are students in the lower quartile [students with learning disabilities and intellectual disabilities] on first semester short writes. We discussed each student at the teacher data walk, then finalized recommendations for the conferences. We encouraged sticky notes for preplanning, using earbuds/phones to listen to the prompt, and CWU (Co:Writer) on laptops for students who would benefit from spelling/word prediction for many of the students [students with IEPs].

In summary, the Instructional Coaches reported a hyper focus on students with disabilities, particularly those that presented the most significant writing challenges (e.g., intellectual disability). When they provided support, teachers directed their efforts towards the lowest 10–25% performing students (as indicated on the progress monitoring data). Thus, a class-wide effort was particularly targeted on students with disabilities.

*Theme 2: Purpose and use of technology tool.*

From the outset of our study, teachers and the ICs that supported them were asked to focus on the implementation of the strategy with the technology solution. The manner in which the two were implemented was based to a high degree on teacher need. Interestingly, teachers quickly saw the advantage of the technology tools as a venue to provide students options in their writing. As noted in the first theme, implementation efforts resided on those with disabilities. A theme in the initial coach logs, and what remained a consistent theme throughout the academic year, was the way technology was viewed as a means to offer options for students to demonstrate their growing capacity in writing, but do so outside the traditional text-based response. One

Instructional Coach familiar with the principles of the Universal Design for Learning (UDL) Framework indicated that the students, through teacher guidance, were applying a number the guidelines and checkpoints aligned with UDL Principle Two. UDL was foreign to most of the teachers and not a focus of this study. Yet, technology use illustrated components of the framework. For example, one Instructional Coach described the use of visuals in replace of text:

As I discovered from my student writing conferences last week, when a student with an IEP did not realize he was to write with a prompt, I discussed creating a video [for the students who struggle] that showed how to do a short write from start to finish [with the strategy and the technology]. I believe Cassie [Instructional Coach] has begun work on the script for that.

The same Instructional Coach followed this up in her next log:

Modified DBQ lesson with writing strategies [STOP or TREE] would be good for video [for struggling students] at some point—visual paragraph writing lesson [through Inspiration] in special education setting to support social studies writing requirements will also be implemented.

Instructional Coaches also shared a significant portion of their technology reports (via the logs) on increasing the quantity of student writing. All three teachers sought to increase student writing. A shared goal across all the classes was to increase the amount of words a student wrote. Whether this was due to a perception that sixth-graders had not been asked to write in fourth and fifth grade or simply the desire to get ideas on paper, coaches focused their attention on number of words. One coached described the effort:

Students are writing a five-paragraph research paper. We are using a new note-taking process where they cut and paste from Word into different topics using the interactive



graphic organizer [Inspiration]. We will then order the facts in chronological order to help writing flow easier through word prediction.

Another coaching log submission illustrated more of the same:

Using Co:Writer with iPads and Google Docs. Rather than cutting and pasting the Google document into Co:Writer, students were able to use the read aloud text feature on the iPad. Those who need Co:Writer for word prediction still used Co:Writer.

In summary, technology implementation appeared to be focused on a specific aspect of writing. Strategy integration was mentioned in the weekly logs, but technology as a tool for a dedicated purpose was central. Similar to the first theme, the primary focus appeared to be the lower 10–25% of the students. Technology tools that aligned with their needs, furthered the writing process, and generated more writing were essential to the primary effort.

*Theme 3: Student writing participation in the writing experience.*

Central to the Coach-teacher interaction was the implementation of strategies and technology tools to further student writing. Coaches' logs indicted weekly effort to integrate the SRSD approach with Inspiration and/or Co:Writer to foster student writing. Yet, the logs were also peppered with entries on efforts to foster meaningful inclusion. Students with disabilities were placed in the general education setting, a model the middle school adopted a number of years earlier. The middle school model (e.g., meeting and planning as a team) fostered a sense of collaboration furthering planning and team problem-solving to meet the needs of a variety of learners. Instructional Coaches reported activities that sought to further include students with identified disabilities. One Coach explained how instruction was designed to target students with disabilities:

The example of becoming much more explicit in directions and increasing processing time for my students (students with IEPs). Each of my students [special education] are struggling with the concept of one word to represent an idea for the inspiration app. Another journaled about how they are working on instructional practices for students with disabilities to expand their understanding and to prepare them for the strategies and the technology that would follow:

I worked with my students [with IEPs] on the proper way to restate and answer questions in a complete sentence. We practiced this in our review game for the story test, and it was the expectation on the test for short answer questions for the entire class.

Log entries increasingly included examples of modeling, tutoring, teacher-Coach discussions, and classroom demonstration that centered on activities beyond writing. Reading was a favorite, but so were suggestions on behavior management, ways to differentiate instruction for students with IEPs, expectations for students that offered more significant learning challenges, and overall suggestions to include the students identified with disabilities across the sixth-grade classes. For example, one coach noted:

We studied class and individual student progress monitoring graphs, trying to identify problems with struggling writers that included students with IEPs. Met with teachers to determine best plan of action for presenting graphs [student progress monitoring data-outcomes] to students with disabilities and the other struggling students. Went over [with teachers] the bottom 25% of each class to brainstorm possible struggles and solutions.

Overall, the Instructional Coaches regularly shared examples of how teachers sought advice and guidance on working with struggling learners and their peers with identified disabilities that went beyond writing. Journal entries were supposed to document weekly efforts

in coaching to facilitate strategy and technology use and thus Instructional Coaches were conscious of this focus. However, as the academic year progressed, weekly entries increasingly documented supports to further facilitate the inclusion of students with disabilities, particularly those with more significant learning challenges (e.g., intellectual disabilities) in the sixth-grade classroom.

### **Discussion**

Our study directly aligns with the recent AAIDD/ARC joint position statement promoting placement in the least restrictive environment, high expectations for all learners, academic integration into general education, the utilization of the UDL framework in designing curriculum and instructional supports, the use of evidence-based practices, increased student participation, and appropriate use of technology. Our study was conducted in inclusive, middle school classrooms led by general education teachers. Teachers planned specific strategies and technologies to address the variable needs of all students. Additionally, strategies and technology were available for all students to use to enhance their writing. Expectations were geared towards increased performance in the academic content required in general education and were supported through integrated use of technology and increased student participation.

Writing instruction is critical for students to communicate, to develop literacy skills, and to support other learning (Graham & Hebert, 2010). Effective instruction of writing is essential for students with ID as well (Joseph & Konrad, 2009). Delivering intervention within inclusive settings aligns to the position statement of the AAIDD/ARC (2018). The results of this study showed effective writing intervention for all students in the inclusive setting. All students demonstrated growth across the three measures. Educator interviews indicated a level of adoption of the strategy and technology tools, demonstrating that students, including those with

identified disabilities, could acquire and maintain advances in writing when using technology and the SRSD approach.

When examining the progress monitoring data, all students acquired, continued to build, and appeared to maintain an increase in the number of words written and word sequence while reducing spelling errors. Visual analysis of the progress monitoring data across the academic year shows growth across all classes and students, and this growth continued from the first to the second semester, remaining in an upward trend as progress monitoring was discontinued in preparation for state testing and end-of-the-year activities. Likewise, findings from Instructional Coaches indicate a hyper focus on the part of the teacher to implement the SRSD approach with the technology, particularly for students with disabilities. Completed in the inclusionary setting, teachers overwhelmingly reported efforts to support the lowest 10–25% as determined through the progress monitoring data. Technology was central to this effort and was identified as a tool to facilitate access and increase student performance, especially in word production. While these findings suggest that combining the SRSD approach with technology tools improves student writing and can be facilitated in the inclusionary environment, they do not specifically identify the direct impact of the combined approach to unique disability categories. Thus, additional studies are needed to further understand the impact to students with ID, as well as their other peers identified with a specific disability.

Our study involved effective intervention combined with technology to facilitate the efficiency and the effectiveness of the selected intervention (Canella-Malone, Konrad, & Pennington, 2015; Erickson, Hatch, & Clendon, 2010). The ability for the teacher to select the SRSD approach with one of two technology tools aligned with previous writing efforts for students with ID (Pennington, Delano, & Scott, 2014; Pennington, Welch, & Scott, 2014).

Likewise, the technology continued to be a necessary support in writing. For students who do not have vocabulary, word retrieval skills, or the level of content necessary, word prediction was found to be beneficial in supporting students to produce words and sentences. In turn, this enhanced the fluency of student writing (Cannella-Malone, Konrad, & Pennington, 2015). In the drafting and brainstorming process, replacing traditional outlines and traditional narratives with visuals that represent those ideas while utilizing software that assists in connecting those ideas was critical for individuals with ID (Erickson, Hatch, & Clendon, 2010).

### **Recommendations for Future Research and Intervention**

Overall, our findings supported teachers' ability to effectively teach writing to all students, including those with ID, in inclusive settings. This is promising for future study to increase inclusive delivery of services to students with ID as suggested in the AAIDD/ARC Joint Position Statement (2018). Results of this study can be used to inform recommendations for future research and intervention.

As shared previously, efforts to systematically study writing instruction with students with disabilities has been very limited. More systematic efforts demonstrating effective practices with students with ID are needed. Inclusive practices will not increase if we continue to go years without additional study (Joseph & Konrad, 2009). Our results highlight the importance and value of integrating effective strategies with proven technologies in inclusive settings to enhance teacher implementation and student need support. Prior research for students with ID reinforces the need to plan and design for the potential barriers and integrate the necessary supports and tools for the successful inclusion of all students (Cannella-Malone, Konrad, & Pennington, 2015; Graham & Hebert, 2010). Our initial findings highlighted the value of the integration of the strategies with technology tools to allow all students, including those with ID, to improve their

writing skills. Likewise, secondary outcomes indicated successful teacher efforts to embed additional inclusionary practices that facilitate student learning and overall writing outcomes with minimal training and embedded instructional coaching. Schools and educators should be encouraged to combine interventions with increasing technology innovations to facilitate student learning. Intentional study of these combinations should be conducted to support other educators in inclusive settings. Technology as a simple tool can be a powerful intervention when combined with proven strategies.

Our study involved Instructional Coaches to facilitate teacher understanding and adoption of the SRSD approach and to combine it with the technology tools. Our findings indicated that ongoing coaching facilitated teacher understanding and appeared to support skill development that translated to classroom use with students. We found teachers were able to use the technology tools and incorporate them into writing instruction and class-wide efforts to support students' development. While teacher training focused on both the SRSD approach and the technology tool, coaching logs indicated teachers focused on tools and supports relevant to the needs of the student, offering the just-in-time support based on what the progress monitoring data indicated as a primary need. Our study suggests that effective teacher training can facilitate intervention and technology adoption for all students within the inclusionary setting. Further research should consider an intervention where the technology tools are separated from the SRSD approach to determine the impact of the SRSD approach with and without the technology tools. Such a study could impact teacher professional development in a way that makes effective inclusive practices attainable by a greater number of educators.

**Limitations**

No research study is without limitations. Primary to the purpose of this article is the fact that the results of the students with ID were not singled out for examination. Our study focused on the inclusionary classroom where all students, regardless of their disability and learning challenge, were included for English language arts instruction, including writing. The purpose of focusing on the inclusionary setting was to better understand the potential impact of the intervention with all students. However, the limitation noted was that we were not able to differentiate findings specific to students with ID. Findings reported growth for all students across the academic year, however, future research needs to differentiate across disability categories to further determine the impact on each sub-group of students. Thus, to fully support this intervention with a specific population, direct studies identifying the participants within that population should be conducted.

An additional limitation is that students were examined against their previous performance via a yearlong progress monitoring tool. Future researchers should consider conducting similar studies using a control comparison treatment model to determine the impact of the instructional approach with the technology tools on students writing outcomes. Likewise, additional measures should be considered for future research. Our study utilized an online progress monitoring system that hosted the writing prompts, automatically scored all student writing, and provided student and class-wide findings via structured graphs for easy understanding and application. However, the limited data (i.e., three areas of scores) may not represent the complete growth of the individual and thus, may not recognize the impact of the intervention.

### **Conclusion**

Writing is an important skill for individuals with ID. As promoted through the position statement of the AAIDD and ARC (2018), learning in inclusive classrooms supported through evidence-based practices and integrated technology is necessary for the educational advancement of students with ID. In 1999, Kliewer and Landis recommended that by “fostering the student’s increasingly valued participation in both the classroom and wider community. Inclusive arrangements that emphasized participation appeared” (p. 99) to do this. This recommendation was made 20 years ago. Today, AAIDD/ARC repeat that recommendation. Interventions utilizing evidence-based practices, integrating existing technology, applied in general education classroom settings, inclusive of students with ID, delivered by general education teachers, can increase student outcomes and participation.



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**Received 8/13/2019, accepted 10/24/2019**

Words: 18

Letters: 58

Correctly  
Spelled: 14

Sequences:  
14

Date:  
02/21/19



Grammar



Spelling

What is the greatest invention? Provide a detailed description and specific examples to support your answer.

A tank that it is a car. Becos thay are faster to get plasis whith is cool

Figure 1. Student writing sample with scoring categories

8th hour ELA (Informational/Explanatory)

Correct Writing Sequence Percentiles  
Compared to National Handwriting Norms

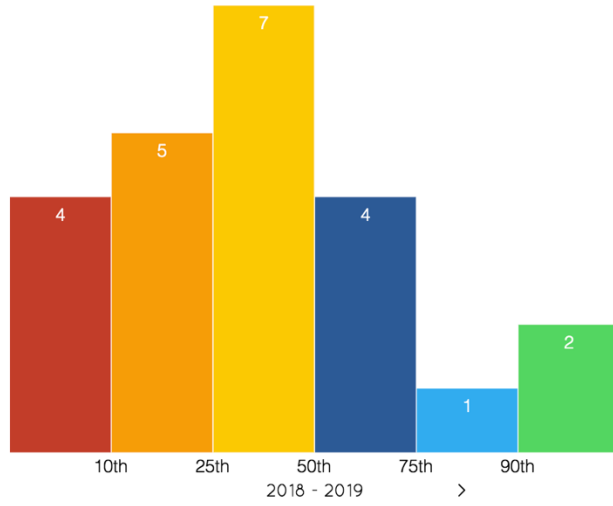
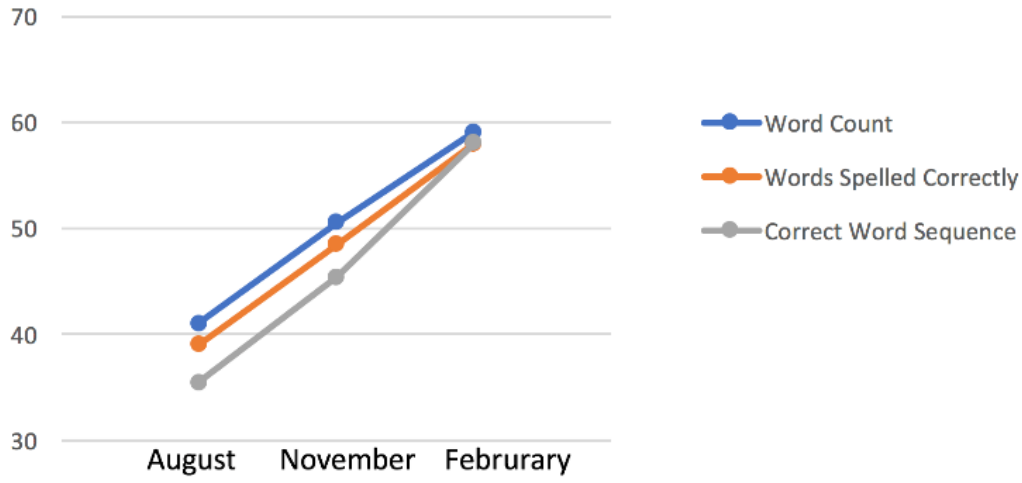


Figure 2. Graph of class wide student progress monitoring data

### Student Writing Growth 2015-16



Note. N = 254

Figure 3. Student writing growth 2015-2016

Table 1

*Number of Study Participants Identified Within Specific Disability Categories*

<b>Disability</b>	<b># of students</b>	<b>Male</b>	<b>Female</b>
Learning Disabilities	18	12	6
Other Health Impaired	5	3	2
Emotional Behavior Disorder	3	3	0
Intellectual Disability	6	3	3
Autism	7	6	1
EL	36	17	19
<b>Totals</b>	<b>75</b>	<b>44</b>	<b>31</b>

Table 2

*Descriptive Statistics, n = 254*

	August	November	February
	Mean (SD)	Mean (SD)	Mean (SD)
Word Count	41.05 (19.63)	50.58 (20.40)	59.08 (25.37)
Words Spelled Correctly	39.07 (19.21)	48.48 (20.01)	57.98 (25.32)
Correct Writing Sequence	35.46 (18.91)	45.40 (20.54)	58.05 (26.96)