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## **Using Technology to Support the Writing of Adolescents with Disabilities**

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### **Author's Note**

Lauren Gibbons is a doctoral student of literacy in the School of Education at St. John's University. Her research centers on best practices for writing instruction, the perceived writing gap between secondary and post-secondary institutions, and pre-service teacher training on writing instruction. Lauren currently works as a literacy consultant, collaborating with teachers and students in local school districts to improve literacy practices. Prior to this position, Lauren taught middle school English for seven years.

## **Abstract**

Adolescent students with disabilities can benefit from technology based interventions for writing instruction, but with so many different tools available, it can be difficult to determine how best to spend classroom time. Students with disabilities struggle with composition knowledge when compared to their typically developing peers (Bouck, Meyer, Satsangi, Savage, & Hunley, 2015; Englert, Zhao, Dunsmore, Collings, & Wolbers, 2007; Evmenova et al., 2016; Smith & Okolo, 2010). This article examines the benefits of using technology to support struggling student writers. The article seeks to connect research supporting technological tools with decisions made by classroom teachers. Four effective practices (the benefits of authentic audiences, the benefits of technology as a pre-writing scaffold, the benefits of word processing programs, and the benefits of computerized feedback) are examined. For each practice, the current research is synthesized, limitations are noted, and classroom applications are provided. Directions for future research and unanswered questions are discussed in the conclusion.

*Keywords:* secondary writing, struggling writers, technology, word processing

## **Introduction**

Within the last few years, many schools have had increased access to technological devices for student use. When these changes came to my own school, I was thrilled to be able to use new tools with my students, yet I felt overwhelmed at all the possibilities. How best should I use this new technology to support my student writers, particularly my students with disabilities? What does the research suggest about using technology as a means of improving student writing, and how can I use this research to make educated decisions about applications and the use of time in my classroom? This article explores the noted benefits of technology use to improve the writing

of students with disabilities, while addressing additional questions for classroom teachers to consider.

### **Why This Matters: Writing, Students with Special Needs, and Technology Use**

Writing is an important skill both inside and outside of the classroom. In school, writing proficiency, along with reading comprehension ability, predicts academic success (Peterson-Karlan, 2011). Writing is a means of developing higher order thinking skills, as well as a tool for supporting and extending classroom instruction (Kiuahara, Graham & Hawken, 2009; Peterson-Karlan, 2011). Additionally, writing is an important skill in the workforce and is directly related to both employment and promotion (Kiuahara et al., 2009; Peterson-Karlan, 2011). For students with special needs, writing is particularly essential because it can improve communication and independence (Wollak & Koppenhaver, 2011). Yet, the state of writing in the United States is alarming. The results of the most recent National Assessment of Educational Progress reveal that only one-third of students met or exceeded grade-level proficiency in writing for Grades 4, 8, and 12. Only five percent of students with disabilities attained such levels (Wilson, 2017).

Compared to typically developing peers, students with disabilities make more mechanical and syntactical errors in their writing (Peterson-Karlan, 2011). They are also often less fluent in terms of number of words and sentences used, and this fluency does not typically improve with age (Peterson-Karlan, 2011). Students with disabilities often struggle with planning, organizing, composing, and revising writing (Bouck, Meyer, Satsangi, Savage, & Hunley, 2015; Englert, Zhao, Dunsmore, Collings, & Wolbers, 2007; Evmenova et al., 2016; Smith & Okolo, 2010). Many students with disabilities lack general writing knowledge, including knowledge about text structure organization, strategies for accomplishing writing tasks, content for the topics selected, knowledge of linguistics, and understanding of audience (Smith & Okolo, 2010).

In an attempt to reform writing instruction for all students, the National Commission on Writing argued that “new technologies can advance both the teaching and learning of writing” (Englert et al., 2007, p. 11). Additionally, a meta-analysis by Graham and Perin (2007b) named word processing as one of the eleven elements of effective writing instruction for adolescents. They note that word processing software has had positive effects for student writing, with the largest effect sizes for low-achieving writers. Yet, the most recent survey of high school writing teachers found that on average, students use word processors for writing assignments less than one time per month (Kiuvara et al., 2009). More current studies report that “there is a limited integration of technology in the evidence-based writing interventions identified for students with disabilities” (Evmenova et al., 2016, p. 172). Along with this lack of teacher application is a noted scarcity of research (Peterson-Karlan, 2011; Smith & Okolo, 2010). There has been a substantial increase in technology availability in recent years, yet there has been a decrease in the amount of research that investigates the use of technology to support students with disabilities (Peterson-Karlan, 2011). The recent research that has been published on the use of technology for writing by adolescent students with disabilities centers around four main themes: the benefits of authentic audiences, the benefits of technology as a pre-writing scaffold, the benefits of word processing programs, and the benefits of computerized feedback. While there are tangible gaps in the literature, the existing research does show that technology use could greatly assist students with disabilities in overcoming traditional writing obstacles.

## **Synthesis of Current Literature**

### **Trend 1: Benefits of Authentic Audiences**

Technology can be used to create authentic writing audiences for students with disabilities. Recent studies report that engaging students in technology-based writing for a specific audience

led to an increase in student motivation, student ownership, and student writing achievement (Rao, Dowrick, Yuen, & Boisvert, 2009; Wollak & Koppenhaver, 2011). Rao et al.'s (2009) pilot study describes the effect of using a multimedia technology platform, TeenACE (Actual Community Empowerment), to produce and share writing for high school students with disabilities. Wollak & Koppenhaver's (2011) seven year case study describes a collaborative e-pal program that paired middle school students with disabilities with pre-service teachers to explore multiple technological writing platforms, including blogs and Twitter.

Both studies report increases in student motivation. A teacher interview at the conclusion of the 8 week TeenACE intervention reveals multiple facets of increased student motivation, including the desire to improve writing, increased confidence, increased perseverance, and increased independence, all of which the teacher attributes to the fact that students knew they would be digitally sharing their work with their peers (Rao et al., 2009). In Wollak & Koppenhaver's (2011) study, increased motivation is reported through student surveys, as well as researcher observation. Students and researchers alike note that the increased motivation was a result of the authentic audiences the technology provided, as students knew that their writing would be read and responded to by their preservice teacher writing partners.

Both studies also note that the respective programs enabled students to take on the role of "expert" for the audience, which led to the use of higher-order thinking skills such as synthesizing, analyzing, and evaluating. As a result, students with traditionally limited background knowledge were encouraged to learn new information to share, allowing students to be both "researchers and creators" (Rao et al., 2009, p. 28). These researchers suggest it is the combination of increased motivation and increased ownership that led to increased writing achievement. Rao et al. (2009) used a modified writing rubric from the Hawaii State Assessment

(Harcourt, 2005) to measure ability to convey meaning, writing clarity, and convention use.

When comparing initial stories to stories produced at the end of the intervention, the mean scores for the group showed a significant increase. Students who had lower initial scores had greater variance than the higher initial performers, suggesting that there may be a ceiling for the effects of the intervention. Wollak and Koppenhaver's (2011) case study analysis focuses on the improvement of student writing through an increase in quantity. They provide the example of John, a student who had difficulty processing language, who was able to double the amount of words and increase his sentence length in his emails over the course of a year in the program.

### **Reflecting on Practice**

In thinking about what this research means for classroom application, practitioners should consider:

- What audiences, inside and outside of my own classroom, could technology use allow? How can I use these diverse audiences to increase student agency? While the benefits are noted, what are the potential risks of expanding our writing audience?
- Who in my classroom needs to take on the role of "expert" for the class? How can technology assist in this process? Where will the technology fall short? What do I need to do as a teacher to support this work?

### **Trend 2: Benefits of Technology as a Pre-Writing Scaffold**

A second trend explores the use of technology to support the planning and organizing stage of the writing process. Englert et al. (2007) set out to determine if providing students with organization and text structure scaffolds through an online platform, Technology- Enhanced Learning Environments on the Web (TELE-Web), would affect writing performance of

elementary school students with disabilities. In the paper and pencil condition, students were given explicit instruction on how to write an informational paper, with teacher models, graphic organizers, and frequent structure reminders. In the TELE-Web condition, students used an online concept map that prompted students and provided them with hints on strategy. The researchers maintain that both groups received the same information and scaffolds, just through different means. Student writing was compared to a baseline and by condition, using a three-point, primary trait writing rubric. Researchers found that students in the TELE-Web condition wrote clearer introductions, had more extensive categorical development, were more likely to contain a conclusion, and contained greater topic depth when compared to the pencil and paper condition. The researchers conclude that the TELE-Web condition can be beneficial for student writing when combined with effective instruction.

More recent research has built upon this Englert et al. (2007) study, but has shifted focus to applications for middle school students. Evmenova et al. (2016) completed a multi-baseline, single subject case study that examined the effect of computer based graphic organizer (CBGO) with embedded self-regulated learning strategies for ten middle school students with disabilities. The five-part CBGO was developed in Microsoft Word, with steps including: pick a goal, fill in table, copy text from table, paste text from table into new text box, and self-evaluate. After the intervention, a maintenance phase provided students with opportunities to write without the CBGO. Baseline, post-intervention, and maintenance assessments measured number of words, sentences, and transitions, as well as holistic quality of persuasive paragraphs. Evmenova et al. (2016) found that most students increased number of words, sentences, and transition words during the use of the intervention, but these numbers declined during the maintenance phase. The researchers argue that all students showed increased holistic writing scores during both the

treatment and maintenance phase, but since the rubric was not provided in the report, it is difficult to determine what the holistic scores measure.

Regan, Evmenova, Good, Legget, Ahn, Gafurov, and Mastropieri (2018) extended this previous research by examining the effects of a mobile-based graphic organizer (MBGO) through a quasi-experimental design. This research explores how flexible mobile technology, the iPad platform, can be used to assist persuasive writing for middle school students with disabilities. Both the control group and the treatment group had access to strategy instruction, graphic organizers, and self-regulation instruction, and students in both groups use an iPad to produce the final writing product. However, students in the control group used paper and pencil graphic organizers, while the students in the intervention group used the five-part MBGO, which uses the same components as the CBGO referenced in the Evmenova et al. (2016) study, as well as a self-monitoring feature. Again, number of words, sentences, and transitions were measured alongside overall holistic quality. The study found that the treatment group outperformed the control group in number of transitions used and overall writing quality, but not in terms of number of words or sentences used. Transfer of skills or assessment of a maintenance phase was not provided in this study (Regan et al., 2018). Although all of these studies show promise, there are many unanswered questions regarding the effects on student writing, in terms of both quantity and quality.

### **Reflecting on Practice**

When examining how technology can be used as an integral part of the writing process, practitioners should consider:

- What planning tools do I currently use for students? How could I digitalize these planning tools? How would I need to adjust my teaching? What might be the benefits of digital graphic organizers/other planning tools? What might be the limitations?
- How can I work to increase transfer of skills from assignment to assignment? What is my plan to eventually remove or modify such scaffolds? What would it look like if students created their own digital planning tools, based upon individualized strengths and weaknesses?

### **Trend 3: Benefits of Word Processing Software**

The use of word processing software compared to a pen and paper model allows for numerous potential benefits. Students can revise their writing through easy manipulation of the text, use word processor supports such as spelling and grammar checkers to improve clarity, and hear their work read aloud using text-to-speech functions. Students can produce legible, portable, and shareable texts more quickly than they can with pen and paper (Bouck et al., 2015; Morphy & Graham, 2012). Graham & Perin's (2007a) meta-analysis on writing instruction for adolescent students notes the positive impact of word processing features, but this research also warns of a great variability among studies. Such discrepancies of effect size were later reported on research looking specifically at the use of word processing for students with disabilities. Bangert-Drowns's (1993) meta-analysis of the effect of word processing for students with disabilities from 1993 reported an average effect size of 0.49 for weaker writers, while Graham & Perin (2007a) reported an average weighted effect size of 0.70 (Morphy & Graham, 642-643).

In an attempt to reconcile this conflicting information, Morphy and Graham (2012) completed an additional meta-analysis that included 20 studies that were not in previous reviews. The studies were all published between 1984 and 2005, with 18 of the 27 included studies

published before 1996. This meta-analysis found significant average weighted effects of word processing software for quality of student writing (0.52), length of student writing (0.48), development and organization (0.66), and mechanical correctness (0.57). However, while the average weighted effect for grammatical correctness was positive, it was not statistically significant. Additionally, there was no statistical significance of the effect on vocabulary use. Morphy and Graham's (2012) findings echo findings from Peterson-Karlan's (2011) meta-analysis on recent trends in using technology to support writing for students with disabilities. Peterson-Karlan (2011) emphasizes the major finding "that teaching students with learning and academic disabilities to use spellchecking strategies combined with text-to-speech output spellcheckers increases compositional accuracy" (p. 51). Peterson-Karlan (2011) additionally notes the scarcity of research surrounding the use of grammar checkers as a tool for students with disabilities.

This research is particularly interesting in light of the shift to computer-based assessments. The NAEP, for example, piloted a computer-based writing exam for 8<sup>th</sup> grade students in 2011. Tate, Warschauer, & Kim (2019) analyzed the data of over 24,100 eighth-grade students from the NAEP exam, along with student survey information and keypress counts. The keypress analysis, which noted the total number of times a student pressed any key, highlighted that students averaged between 2,000 and 3,000 key presses, but rarely used the cut, copy, or paste functions. The spellchecker feature was used, on average, 1-2 times per student. The researchers note that students with disabilities had a decreased number of keypresses when compared to peers and that keypress activity predicted writing achievement. These studies highlight the need for continued research on the use of word processing programs for students with disabilities. While there are clear benefits, further information is needed regarding the

impact of grammar checkers, as well as the implications of using word-processing software for large scale writing assessments.

### **Reflecting on Practice**

In thinking about how technology can be used to encourage editing and revision, as well as the ramifications of this for assessments, practitioners should consider:

- How often do I ask students to use a word processor to draft, write, and revise their work? How often do I provide direct instruction on how to properly use spell checkers and grammar checkers? How can I teach students to use the cut, copy, and paste functions to better improve their writing?
- Do my students use word processors for large scale assessments? How can I support students as we switch over to computerized assessments? What additional teaching will this require?

### **Trend 4: Benefits of Computerized Feedback**

Additionally, technology can provide teachers with an efficient way to provide feedback to student writers. Morphy and Graham (2011) found that the type of word processing program used by students with disabilities matters. As mentioned above, the use of a basic word processor, when compared with pen and paper, showed sizable effects. Yet, the use of additional features such as external instructional supports or the use of voice recognition did not lead to significantly different results than the basic word processor. There were three studies in the Morphy and Graham (2011) meta-analysis, however, that added internal supports to the word processor, in the form of automated feedback, which showed substantial gains in writing quality. The researchers converted the average weighted effect sizes for this specific type of word

processing program to NAEP writing scores from eighth grade students with disabilities. In doing so, the researchers predicted that the impact of such an intervention could actually allow students with disabilities to exceed the national average scores (Morphy & Graham, 2011). As only three studies in the meta-analysis used this intervention type, such interpretation of data should be considered cautiously.

Building upon the work of Morphy and Graham (2011), Wilson (2017) studied the effect of automated essay evaluation (AEE) software, a program that provides students with immediate feedback through both essay scores and targeted, individualized suggestions. In this study, students with disabilities and typically developing students used Project Essay Grade (PEG) Writing, an AEE program. Students selected a standard-align writing prompt, submitted a draft in response to the prompt, and then received scores based off the six traits of writing, along with specific feedback on spelling and grammar, trait-specific improvement, and customized tutorial links for review of certain skills. Students could resubmit as often as they wanted, receiving new feedback each time. Wilson (2017) found that students with disabilities engaged in the same amount of revision as their typically developing peers. While students with disabilities' initial draft scores were lower than typically developing students, "their overall writing quality grew at a statistically significantly faster rate" (Wilson, 2017, p. 711). The performance gap was closed after five drafts. In a specific trait analysis, AEE enabled rapid growth in organization, word choice, and conventions. However, no transfer growth was found when students were assigned a new prompt without the feedback supports. The benefits of automated feedback appear promising, but the research body is still too limited to draw any definite conclusions.

### **Reflecting on Practice**

When considering the impact of technology on teacher feedback, practitioners should consider:

- Do I use automated feedback in my writing classes? How do I use this feedback--- as a grade or a tool for revision? How are students expected to interact with this feedback?
- How often do I allow students to revise? How could automated feedback be used in addition to teacher-student conferencing? How can the use of automated feedback lead to greater independence of student writers?

### **Summary & Conclusions**

As noted above, students with disabilities typically struggle during all stages of the writing process. Recent research on the use of technology to assist writing for students with disabilities has demonstrated positive results. Programs that have used technology to create authentic audiences for writing have shown increases in student motivation, ownership, and achievement. When technology is used as a planning tool, such as a digital graphic organizer, holistic writing quality increases. The use of word processing software can lead to increases in the quality, length, development, and mechanical correctness of student writing. Automated feedback programs can help students with disabilities revise their work, allowing for achievement closer to that of a typically developing student. While these findings are all positive, they are far from conclusive or comprehensive.

The research to date is limited in terms of both the number of studies and the depth of the studies. There were few recent articles published on the topic of using technology to assist the writing of adolescent students with disabilities, and the research that does exist tends to be more descriptive than experimental (Peterson-Karlan, 2011; Rao et al., 2009; Wollak & Koppenhaver,

2011). Although there have been a handful of recent meta-analyses, the studies used are often dated and do not reflect the current available technology. Additionally, most of the interventions studied have been short term, typically only a few days long, and focus almost exclusively on middle school students.

Directions for future research include greater attention to high school level students, improved assessment, examination of the big picture for student writing, and the achievement of transfer. A surprising finding from this review was how few studies focused on students beyond 8<sup>th</sup> grade. With the great concern for the perceived writing gap that exists between secondary and post-secondary institutions, it is logical to further investigate how technological tools can be used to better aid high school students with disabilities. It is also clear from this review that the field would benefit from more universal tools for measuring writing achievement. Some studies measured writing achievement through an increase in word count and sentence length, while others used primary trait rubrics or researcher created holistic rubrics to measure growth. This makes it challenging to compare results from one study to the next. Additionally, since the current research focuses on short interventions, the field would benefit from more long term studies that look at comprehensive writing instruction through technology. Lastly, few studies examine the elements of transfer and maintenance after the use of the technology intervention. Since the ultimate goal is to create stronger writers, not just a single piece of strong writing, more research in this area is recommended. The existing research reviewed in this article shows much promise, so these directions for further research feel worthy of our attention as classroom practitioners and researchers.

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