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RESEARCH ARTICLE

Programming for Students Who Struggle with Writing: How Strategy Instruction, Technology and Assessment can Promote Students' Writing Improvement

Michael William Dunn

College of Education, Sport, and Human Sciences, Washington State University Vancouver, Vancouver, WA, USA

Correspondence to: Michael William Dunn, College of Education, Sport, and Human Sciences, Washington State University Vancouver, Vancouver, WA, USA; Email: dunnmi@wsu.edu

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Abstract: Writing can be a challenging task for many people. Developing ideas, organizing them into an outline, spelling words, creating sentences with descriptive adverbs and adjectives, and making edits for a finessed final copy require an ability to manage these tasks concurrently to help make the ideas and phrases flow into a coherent text. For educators as well as governmental departments of education who create and manage yearly testing, there are many options for how writing can be assessed; assessment choices play a part in defining students who struggle with writing. This conceptual article discusses the challenges that students who struggle with writing face, technology tools that can help and how assessment of students' skills can be designed and applied to progress monitor (assess) writing content and quality over time. The conclusions of this article emphasize the benefits of employing research/evidence-based practices for writing with technology tools. The implications are that students who struggle with writing can benefit from step-by-step (strategy) instruction, progress monitoring their written content and quality skills as intervention programming sessions progress, and employing technology tools to help with idea generation, spelling, grammar/syntax, and revising ideas.

Keywords: students who struggle with writing, technology tools, writing assessment, special education

1 Introduction

Writing is an essential skill to have in our technology-driven and knowledge-based world (Gautam, 2019; Griffin, 2020). The advent of computers and the internet in recent decades have accentuated the importance and need for people to be competent managers of written text. Unfortunately, there are many people who struggle with writing. Students with a learning disability, autism spectrum disorder, intellectual disability, emotional disturbance and/or attention deficit hyperactivity disorders, to name some examples, often have writing goals and objectives as part of the Individual Education Plans. Other students in general education too may have difficulty managing the planning of ideas, creating and editing text, and making a finessed written product (Troia, 2021). As with other academic skills, assessment of students' writing can offer helpful insights into their strengths and weaknesses for content and quality. This article discusses key aspects of writing such as: how writing can pose challenges for students, the variety of options that educators as well as governmental agencies of yearly testing have as options to assess for writing, and how technology and artificial intelligence offers novel options for assessment and feedback.

Literacy (reading and writing) proficiency rates vary amongst countries due to a lack of consistent reporting practices and a standard definition. Globally about 13% of people aged 15 and above are illiterate (Literacy Rates, 2024). Students' writing is typically reported as the percentage of being either at or near grade-level criteria. National assessments' results of students who are proficient at writing vary by country (*e.g.*, Australia 84.1% (2023), United Kingdom 69% (2023), and the United States 24% [National Assessment of Educational Progress {NAEP} for Writing, 2011]. As these three examples indicate, there are many students who struggle with this core subject. Writing and reading have a symbiotic relationship as each supports the other for a student to improve. Many educators (*e.g.*, Alneyadi et al., 2023; Graham & Harris, 2019; Harvey, 2023) acknowledge writing's interconnectedness with reading from elementary to high school grades as well as university (*e.g.*, Graham & Hiebert, 2010; Keathley, 2022; Nelson & King, 2023). Computers and mobile devices offer students applications (*e.g.*, eReaders, Grammarly) that can help students to manage writing tasks and finding content to

complete class activities (Laurinavicius, 2024; MacArthur et al., 2022). This article's synopsis of classroom practices for writing with technology tools can help inform educators' thinking and management of writing instruction and assessment for students who struggle with this skill (Selvarasu et al., 2021).

2 Challenges of Students who Struggle with Writing

To become a better writer, the first step is to read more high-quality/published texts (Mason et al., 2023). We can learn a lot by reading, reviewing and analyzing the works of others (Graham, 2020; Graham, 2019; Kim, 2020; Tai et al., 2017). The reader can see how the author managed ideas with their choice of words, sentences, paragraphs, and text progression. The reader can detect how the author employed different types of sentence phrases (*e.g.*, subordinate clauses), adjectives, adverbs, conjunctions, etc. Discussing a text with others can help a reader to see even more of these features and ideas within a text. Yet, these practices are a challenge for some people. The underlying reasons for not being an avid reader are often due to low decoding ability, a lack of positive literacy practices at home, and a missed opportunity to learn how to pair personal interests with choosing texts to read to make the practice habitual.

When a student is asked to begin writing a new text, the first step is to generate ideas (Heong, 2013). Precious time during a classroom lesson may be lost as a student who struggles with writing (and often reading) lingers in not defining what a possible topic and subtopics could be. A peer or the teacher's help may be needed for the student to decide a topic and create an outline. From these initial stages of the writing process, motivation and initiative is needed to sustain a student's drive through all the steps in the text-generating process including a willingness to keep thinking and rethinking about ideas, where they fit in the progression of the text and how best to phrase them (Chandler et al., 2021).

As students begin to use their outline to generate sentences and paragraphs, spelling and word choice can be an initial challenge (Chung et al., 2020). By reviewing other writers' texts, students can see models of how to create sentences and what each word's spelling looks like. The choice of words and sentences form the foundation of a student's text as their writing moves from beginning, middle to ending summary. The results of having difficulties with these skills are texts that are short, have incomplete phrases, and minimal progression of ideas.

Once a first draft is created, a writer then needs to review and make edits for a final copy (Graham & Harris, 2019; Nugroho, 2021). For a student who struggles with writing, it can be difficult to read their own text and know what edits to make. Students can be exhausted at this point from the process and submit much of their first draft as their final text (Dockrell et al., 2019).

3 Example Instruction and Assessment Components of an Intervention for Writing

Participating in an intervention can offer the student a strategy and series of steps to help them self-regulate the writing process (Ahmed et al., 2022; Graham et al., 2020; Harris & Graham, 2017). Prior to beginning an intervention, the teacher(s) with the general/content-area teacher(s) should review the student's recent written texts to determine what the strengths and weaknesses are. This will help define what type of intervention components would best help the student to improve. The student may be having difficulty with narrative story writing, for example. Reviewing this genre of stories and learning a new strategy (*e.g.*, mnemonic) for this purpose would offer the student a new opportunity for improvement.

Many strategies and assistive technologies exist to help students who struggle with writing. Some examples are: mnemonic strategies (*e.g.*, Plan, Organize, and Write) (Saddler et al., 2004), practices (*e.g.*, self-regulated strategy development; SRSD) (Graham & Harris, 2019; Kim & Graham, 2022), web applications (*e.g.*, Grammarly) and web tools (*e.g.*, Purdue's OWL). For most students who struggle with writing (and reading), a more collective set of intervention session components may be needed, including the instruction from an intervention teacher to manage strategy choice, instruction, choice of apps and webtools, feedback, and ongoing assessment of a student's skills across the intervention's timeline (*e.g.*, 12 or more sessions, 30-60 minutes in duration).

Table 1 offers example intervention lesson plans. Teachers can apply these practices to help students improve their writing skills.

Table 1 Example Weblinks to Intervention Plans for Writing

Source	Description	Weblink
National Center on Intensive Intervention	This lesson provides a structure for a writing intervention with examples of asynchronous and synchronous virtual delivery.	Virtual Lesson Example: Writing Lesson — NCII (intensiveintervention.org)
SRSD online	SRSD has been the subject of extensive study and has proven to be the most effective approach to writing instruction among those studied by academics.	Explore SRSD - Free teacher tools, books and research (srsdonline.org)
International Dyslexia Association	Discusses strategies such as: a) linking of semantic feature analysis with sentence instruction; b) sentence fluency techniques; c) "micro-discourse" methods for supporting cohesion and text elaboration (Laud & Haynes, 2018; Jennings & Haynes, 2018).	Structured Literacy Approaches to Teaching Written Expression (https://dyslexiaida.org/)
UK Department of Education	Start young children off with mark making and work on hand-eye coordination and finger strength to prepare them for later writing.	Help for early years providers : Writing (education.gov.uk)
American Institutes for Research	Describes the writing component of the Attaining Core Content for English Language Learners (ACCELL) model focusing on scaffolding writing in connection with close reading activities.	English Learners and Close Reading: Providing Scaffolding for Writing — American Institutes for Research (air.org)
US Institute of Education Sciences	These practice guides offer educators specific, evidence-based recommendations that address the challenges of teaching students in grades 2–12 to write effectively.	Teaching Elementary School Students to Be Effective Writers (ed.gov) Teaching Secondary Students to Write Effectively (ed.gov)

Assessment of students' writing should include content (does the text include the key subtopics for its genre (*e.g.*, does a narrative story answer questions such as: who, when where...?) and quality (does the text's organization and readability demonstrate the level of prose per the student's grade level?) (*e.g.*, Graham & Harris, 2019; Kim & Graham, 2022; McMaster et al., 2020). Curriculum-based measurement (Deno, 2003) is a prime example of assessing students' texts for content and quality. Intervention teachers can review a student's text and assign a score (*e.g.*, /10). As a reference in doing this, teachers could use Smarter Balanced Assessment Consortium's (2014) exemplars and comments as to what a low versus high quality or content text could be at a given grade level.

Other curriculum-based measurement types of assessment for writing are: number of words spelled correctly, number of letters written, and the number of correct writing sequences where each aspect of syntax is scored (*e.g.*, use of punctuation to end a sentence, beginning a new sentence with a capital letter). The 6 + 1 Traits (Education Northwest, 2024) employs rubrics focusing on content, organization, word choice, voice, sentence fluency, conventions, and presentation. Many educators employ rubrics (*e.g.*, Smarter Balanced Assessment Consortium) to clarify expectations with students and score their written texts. Lesson plans for writing (*e.g.*, Graham et al., 2020) tend to follow the sequence of the writing process and where students can struggle, as described earlier. Table 2 lists example lesson plan components.

Table 2 Example Lesson Plan Components and Description

Lesson Plan Component	Description
Baseline assessment data	Have the student complete five curriculum-based measurement writing probes (*e.g.*, one per day) to establish a baseline level of writing skills (content and quality) before intervention programming and a new strategy begins).
Reading a short published text	The student (or intervention teacher) reads a portion of a text (*e.g.*, one or more paragraphs) that is at a level slightly challenging for the student.
Discussing the text	The intervention teacher and student discuss the text, paraphrase it, and analyze the author's chosen type and word choice of the sentences (*e.g.*, simple, compound, use of adjectives/adverbs, etc.). What was the author choosing as words and sentences to make the text more interesting for the reader?
Spelling practice	The intervention teacher chooses 3-5 words from the text, voices them one at a time for the student to spell on paper via keyboarding. The teacher reviews the student's spelling and provides feedback.
Sentence practice	The intervention teacher asks the student to create two or more sentences about the passage and use simple or compound sentences with adverbs, adjectives, etc. The teacher provides feedback on the student's writing.
Learning and practicing the new strategy	The intervention teacher can explain the new strategy's features, model its use a few times, and then have the student begin sharing in working through additional practice examples (*e.g.*, steps of SRSD).
Student's self-management of the strategy's use	The student employs the new strategy independently with the teacher's feedback and review. Curriculum-based measurement writing data is collected 1-2 times per week to determine if the student has changed (increased) in content and quality.

The nature of intervention programming is to offer students who struggle with a skill a new sequence of tasks and/or a new strategy to better self-regulate a process such as writing. Whereas general education programming typically has students compose a text with a prompt (*e.g.*, what did you do for fun this past weekend?), the teacher or a peer's reviewing spelling of words and sentence formation would likely be through incidental teaching or as part of a short review either with a small group or the whole class.

The activities described in Table 2 provide for a more systematic approach to the writing process, which offers a student who struggles with writing a more step-by-step method and strategy (*e.g.*, Plan, Organize and Write [POW]; Saddler et al., 2004) to manage idea creation, planning, spelling, sentence creation, text progression of ideas and editing. A teacher or proficient peer's help is imperative in the initial sessions of doing these activities as well as follow-up feedback after the student has mastered the steps of the new strategy. Programs and tools can offer the student more immediate help and an even higher possibility of improvement over time. Analyzing students' progress on a daily or weekly basis helps to monitor an intervention's effectiveness and if any part(s) of the intervention could be changed and improved.

4 Large-Scale Assessments of Writing

International, national or regional assessments of students' writing can offer educators and legislators more wide-scope insights into student' skills with writing (Stagg et al., 2012). In national and regional (*e.g.*, states, provinces) writing assessments of students in middle and secondary public schools, texts are typically assessed as either a percentage of being either *at* or *near grade-level* criteria. To represent that score, assessment creators have a number of choices in designing a writing assessment; some examples include: the choice of students from a given grade(s); time length (*e.g.*, 30 minutes, samples from a student's writing portfolio over the past year); use of laptops or tablets; type of genre (*e.g.*, students likely have less familiarity with writing an informational text on an assigned topic as compared to writing a narrative story on a topic of the student's choice); multiliteracies theory (*e.g.*, linguistic diversity, use of technology. Oozeerally et al., 2020; and collaborative writing of Web 2.0 practices (Mastropieri & Scruggs, 2024; Montiel et al., 2020). In sum, the selected choices for how students are to complete writing-assessment tasks, students' skill levels with writing and reading, and the type of assessment prompt may all play a part in students' resulting score of writing proficiency.

The Organization for Economic Cooperation and Development has invited participating countries every three years to have students (ages 15.3-16.2) from a selected sample of schools to complete the Programme for International Student Assessment (PISA, 2024) tests of mathematics, reading, science, creative thinking, and financial literacy. Writing tasks are embedded into the reading assessment. In completing computer-based tests, students were assigned a set of test items based on their performance in the first section of the assessment. They also answered a background questionnaire. Reading (and writing) test items included multiple-choice questions and free-writes to construct their own responses. In the PISA 2022 Results (Volume I; Table I.2.2) (range of mean scores: 409-575), Canada (507), the United States (504), and the United Kingdom (494) all scored significantly above the overall average for reading (with writing).

A selected summary of national or regional public school writing assessments from the United States, Canada, the United Kingdom and Australia is provided in Table 3. National and regional test results offer insights into what percentage of students struggle with a skill such as writing and may benefit from intervention programming These results, including many from late secondary grades, offer some insights into students' writing skills, per their assessment grade(s) and framework (*e.g.*, timeframe, students' having choice in the writing topic—or not). Test designers had students complete the assessments in Table 3 with laptops as this is the type of device many people use.

In the National Assessment of Educational Progress (2011), only 24% of grades 8 and 12 students were proficient in writing. California's Smarter Balanced (2022) writing assessment concluded with 46% of grade 11 students at or near grade level criteria. The United Kingdom's (2023) grades 3-6 students score was 69%. Alberta (89%; 2022) and Australia (84%; 2023) scored as the two highest. The District of Columbia (United States, 2022) and the Province of Ontario (Canada, 2022) assessments combined writing with reading. Of the District of Columbia's students, 33% scored at or near grade level whereas Ontario's grade 12 students scored 82%. In terms of scoring, the United Kingdom had each student's teacher provide a writing score whereas other countries had trained scorers rate each student's texts. Other factors can impact students' scores too such as socioeconomic status, the teacher's comfort level in teaching writing, the student's familiarity with the topic, and literacy practices offered at home,

to name a few examples (*e.g.*, Census Canada, 2021; U.S. Census Bureau, 2022).

Table 3 Selected Writing Assessment Results (Defined as Either At or Near Grade-Level Criteria)—or as Integrated within English/Language Arts (ELA)

	Writing	Grades	ELA	Duration	Choice in Writing Topic
United States					
NAEP-Writing (2011)	24%	8		2@30 mins	No
NAEP-Writing (2011)	24%	12		2@30 mins	No
California SBSA (2022)	46%	11		3 hours	No
PARCC District of--Columbia (2022)		9-12	33%	60-110 minutes[1]	No
Canada					
Alberta (2022)	89%	9		4 hours	No
Ontario (2022)		9	82%	2 hours[1]	No
United Kingdom (2023)	69%	3-6		Year-long writing--portfolio[2]	Yes
Australia (2023)	84%	9		42 minutes	No

Notes: [1] Time for the writing-portion tasks may be half of this amount. [2] The United Kingdom's writing test was a type of portfolio assessment. Each teacher was to review a student's independent writing products and define the student as either: working towards the expected standard, working at the expected standard, or working at greater depth.

The United Kingdom's (2023) writing portfolio system did yield a high score amongst those listed in Table 3. Conceptually speaking, combining writing as part of English/Language Arts (ELA; *e.g.*, District of Columbia, 2022; Ontario, 2022) may offer benefits to students' managing writing skills given how reading and writing have a certain synergy when integrated together (Graham et al., 2022; Graham, 2019; Schunk, 2020; UK Government, 2024). Ontario (82%) was near Alberta and Australia's scores. However, there was a wide difference in ELA scores for the District of Columbia (33%) versus Ontario (82%). Both are predominantly English speaking, offer a similar public school system, and have similar low-income rates: Ontario 10% (Census Canada, 2022) versus District of Columbia 17% (U.S. Census Bureau, 2022). Yet, the two regions are geographically very different in size and community types (*e.g.*, total population; Ontario is a mix of rural, suburban, urban). Comparing the details of the ELA assessments' administration process and how they were scored may offer more of an explanation.

In summary, assessing writing offers a wide range of choices along with the context of what students do as part of the writing process (*e.g.*, the UK's student-chosen topic versus NAEP's assigning one to students). Offering students a choice in a topic can help them improve as they are likely more invested in writing about a topic that they like (Tai et al., 2018). This can help students improve their curriculum-based measurement content and quality scores (Deno, 2003); these formative-type assessments can be done daily or at least every fourth session to offer the intervention teacher/team a sense of students' change in skills over time and what next steps might be (*e.g.*, changing the intervention's components; or with students' improvement, ending the intervention).

5 Webtools for helping improve Students' Writing and Assessment Scores

The growth in webtools for writing (software and applications) has offered a new source of help to students (Alkhataba et al., 2018). Multiple webtools exist for each part of the writing process. Companies and professional organizations have also made webtools the focus of their mission (*e.g.*, CoWriter SOLO, 2024; ISET, 2024). Table 4 offers example webtools based on the sections of Table 2.

Artificial intelligence webtools offers a new realm of means to attain access to writing examples and feedback (Salvagno et al., 2023). While plagiarism has long been a concern with online sources, artificial intelligence has prompted additional concerns that users can easily attain a text and claim it as their own, such as for school/university course assignments. The United Nations Educational, Scientific and Cultural Organization (2025) and European Union's Artificial Intelligence Act (2025) each offer a framework to promote fairness, social justice and accessibility for all. Artificial intelligence systems should be overseen by people, not automation, to prevent harmful outcomes. Packback, an online writing assistant for student writers and teacher/instructor graders, suggests that artificial intelligence can be used ethically for writing such as offer grammar correction to phrases as sentences (similar to Grammarly and

Table 4 Lesson Plan Components with Example Webtools

Lesson Plan Components	Webtool Examples
Reading a short published text	YouTube offers many books to which students can listen and see the text as it reads. Most computers and mobile device offer free screen readers so that any text on a screen can be read to the user.
Discussing the text	Teachers and school librarians, for example, can organize book clubs for kids. How to Set Up a Virtual Book Club for Students (Edutopia.org)
Spelling practice	Spellquiz (spellquiz.com)
Sentence practice	Write and Improve (cambridgeenglish.org)
Paragraph practice	Paragraph Punch: An Interactive Online Paragraph Writing Activity
Editing help	ProWritingAid: The AI-Powered Writing Assistant

Microsoft Editor), brainstorming for idea generation, inputing notes into an artificial intelligence generator (*e.g.*, ChatGPT) and asking for practice test questions, or asking artificial intelligence to segment a complex concept into its component parts to help improve student understanding.

The key in using artificial intelligence tools includes composing the prompt so that the user attains the type of response that they seek. Grammarly (2024) suggests users: 1) focus on one goal or task, 2) the user(s)'s preferences, 3) use of clear and precise language, 4) add context and specifics to help with focus, and 5) include examples of desired outputs. An example artificial intelligence command using these criteria could be:

Pretend you are a secondary student seeking a high-quality paragraph about the reasons that initiated the US Civil War to help improve your own writing. The preference is to use text that is grade 10 or higher in quality. An example is: "For more than 80 years, people in the Northern and Southern states had been debating the issues that ultimately led to war: economic policies and practices, cultural values, the extent and reach of the Federal government, and, most importantly, the role of slavery within American society" (National Park Service, 2024). Please provide three more examples.

Tate and colleagues (2024) examined the use of artificial intelligence for assessing writing and found that by providing detailed commands to ChatGPT similar to the one described above (minus an example), the generated scores for students' texts were not statistically different from what humans had graded. The writing samples data consisted of three samples (n = 493; n = 344; n = 949) across grades 6-12 students' argumentative essays. Using artificial intelligence may be sufficient for the purposes of low-stakes formative assessment.

6 Summary

Assessments of writing illustrate that many people struggle with this core skill given its many subtasks (idea generation and progression, spelling, sentence writing, paragraphing, etc.) that need to be managed concurrently by the author to produce a finessed text (*e.g.*, Gautam, 2019). Strategy instruction can help (Graham et al., 2020; Harris & Graham, 2017). When a writer does not have the experience to know how to start generating ideas, organizing them into an outline and then spelling words and sentences into paragraphs, learning a strategy that offers a step-by-step sequence can be helpful. The wealth of writing intervention research study findings demonstrate that many students have improved assessment (progress monitoring) scores thanks to strategy instruction. A key feature is maintaining the students' use of the strategy over time so that they continue to use it and apply it to similar types of tasks. Pairing this practice with web applications that people use for writing, such as Grammarly and artificial intelligence, can empower students' success even more.

Webtools offer an added source to improve students' writing (Alkhataba et al., 2018). Artificial intelligence can offer students exemplars for the type of genre that they seek to write. Instructor videos can explain an assignment's rubric and what components a given text needs to include. As students draft and make edits using spelling and sentence feedback apps, their prose can become more detailed, descriptive, and engaging to the reader. All of these collective ideas represent sources for help to students who struggle with writing. Improving one's writing requires prolonged practice and commitment. The most important step is to start with helpful tools, such as those mentioned in this article, and then practice weekly to make improvement in assessment (Deno, 2003) scores over time. Writing is a key need in today's knowledge-based economy. Improving one's writing skills can offer students significant benefits for work and life.

7 Implications for Teachers and Future Directions for Research

The findings from the discussion of writing and assessment in this conceptual article indicate that many students struggle with writing tasks. Governmental leaders, educational policy makers, school district administrators, teachers, parents and community partners need to work together to provide students who struggle with writing the resources and tools that can help them improve. Teachers can benefit from learning more about strategy instruction for writing, what assistive technology tools can help, how students can ethically apply artificial intelligence for practice and feedback, and assessment practices that help students work to address aspects of writing that pose challenges. The next steps for writing research can focus on students' use of artificial intelligence in terms of students learning how to use the tool for idea generation, feedback about drafting text, spelling and making sentences, making grammar/syntax edits, revising ideas and finessing a final copy. Many apps and devices will likely incorporate artificial intelligence in future iterations of each tool. Researchers can help explore students' thinking as this collective set of writing resources develop so as to help students be knowledgeable consumers of tools that can help them manage and improve their writing skills.

Conflicts of interest

The author declares that they have no conflict of interest.

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