~ Chapter 3

Making Words Count: Writing Across the Curriculum and Beyond

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Abstract

The teaching of literacy/language arts and mathematics is not a pairing traditionally found in classrooms. However, there are ways to link the two vital core subjects. This article will explore using writing as a tool for students to work through mathematical processes by integrating writing and literacy curriculum as a subject to complement, not complicate. The application of knowledge and adapting prompts and scenarios to personalized settings in mathematics and literacy classrooms will be highlighted. What is shared will be relevant to students' lives through the application of practical strategies and approaches for planning and instruction as an individual educator or on grade level teams in a variety of grade levels. The perspectives, thoughts, and activities shared in this article result from presentations and research shared with literacy and mathematics educators and the need to work beyond content area teams to support students in their literacy journeys.

Keywords: *writing, literacy, mathematics, cross-curricular connections, engagement*

Writing is a form of expression that is prevalent in all areas of daily life and society, but in educational settings, too often the writing related assignments are left solely to the literacy educators and literacy specialists. Literacy/English Language Arts (ELAR) and mathematics are often characterized as difficult subjects (Castles, Rastle & Nation, 2018; Elleman & Oslund, 2019; Langoban, 2020). A student may get labeled as a "reading/writing person" or a "math person" based upon performance and preference for either subject. This narrative needs to change, and it would be beneficial for educators to help effect this change since both core subjects are foundational and necessary for students to succeed. In reference to the communication process standards in math, the National Council for Teachers of Mathematics (2000) states, "When students are challenged to communicate the results of their thinking to others orally or in writing, they learn to be clear, convincing, and precise in their use of mathematical language" (p. 4). Good teaching and effective literacy (and math) lessons should span across subject areas. This should not be limited to a single classroom experience or one content area educator.

Those in education in the past few years have been faced with the strains of a pandemic, school safety, access and equity, and many other issues. Writing might not solve all of the problems in education, but the teaching and

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learning of writing can allow for innovation and creativity within and across curriculum. Evolving curriculum involves taking some risks and facing challenges and fears.

Addressing Fears and Frustrations with Writing

Writing is often taught to students as a necessary skill to communicate, but students sometimes do not understand the purpose of writing assignments and skills that are presented within their classrooms. Traditionally, the purposes of writing shared with students are that writing is used to inform, persuade, for literary work, or as a form of expression. Writing for students in the primary grades involves teaching skills to build symbols, scribbles, and drawings into letters and words, and then transforming words into meaning and phrases. In this process, students gain the tools needed to be confident in expressing, creating, or writing informatively. Due to how students are nurtured and taught, their confidence can become shaken, and writing becomes a sore spot in their educational journey.

Fears and frustrations that students run into with writing instruction can be improved by educators and their ability to facilitate and foster an environment of collaboration and love for the process and end products that writing brings about. It is a mistake to leave the responsibility of writing instruction solely to the ELAR educator. Golden (2007) states, "By designing lessons that ask students to listen, read, and write in math class, teachers can teach and practice ELA skills that will benefit students in both math and ELA classes" (p. 47). Just as it takes practice and multiple interactions with skills learned in other core subjects such as math), writing is not a subject that should be cultivated every once in a while; writing should be seamlessly integrated across subject areas.

Making Words C.O.U.N.T.

In mathematics, one of the foundational principles is knowing how to count or knowing that numbers hold value, and in writing instruction, students begin learning about words and word meaning, then learn sentences/phrases, and then later learn the styles and purposes for writing.

Making words "count" involves the educators teaching the skills and knowledge of other content areas through integration (Cunnington et. al, 2014). There are other ways to make connections with math and literacy beyond completing word problems. Math and reading and writing are often not paired together, but when they are, the correlation between word and vocabulary knowledge and solving word problems is usually the only link that is explored. The two core subjects that are normally unrelated have more in common, and the ability to integrate is easier than once thought. The focus should be on finding ways to continue writing beyond the designated ELAR class times and implementing writing and literacy skills in moments that normally only focus on computation and multistep processes. Writing *can* take place in the mathematics setting. Below is the "C.O.U.N.T." acronym, as created and shared by Childs at the TALE 2022 Annual Conference, which discusses how math and writing can be used simultaneously in a classroom setting:

- ***"C" Cultural Responsiveness and Engagement with Writing Tasks in Mathematics-*** *Take items from popular culture that students are familiar with (social media, music, sports) and create general writing prompts that tie culture to mathematics, to which the students can respond on a weekly or daily basis. For example, students could write on the statistics of their favorite sports team or music artist.*

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- ***"O" Opportunities to Write Should Be Authentic and Relevant-*** *Create a space for students digitally or in a physical classroom to write about the value of math in everyday life. Showcase the ideas and observations around the learning environment.*

- ***"U" Unpack Problems Using Writing-*** *Charts, graphs, and graphic organizers are forms of writing that organize and break down data.*

1) Provide flash cards, charts, or graphs to students, and have them write word problems related to the equation on the card.

2) Within the word problems, use key math vocabulary, and incorporate everyday problems that might occur.

3) Have students include themselves or people that they know in their math problems.

- ***"N" Narrative Writing Crosses Curricula-*** *Many ELA terms correlate with the problem and solution processes used in mathematics. "Point of view" and "chronological order" are terms that come to mind. Using various solutions/notes, try using the following prompts to help students correlate math and narrative writing:*
    - *I think they were thinking…*
    - *This problem tells the story of…*
    - *Problems can be solved in more than one way. My point of view on this problem is…*

"T" Track Thought Processes Through Writing- *In the literacy world, we are asked to "cite our sources." In mathematics, students are asked to "show their work" or "give proof" of their responses. Have students look at notes and examples of student work or finished problems and then critique the notes or problems in writing.*

The suggested activities and strategies mentioned will look different at various grade levels, but the point in sharing these activities is to show that there are ways to make relevant and engaging (Francois, 2021; Schnitzler, Holzberger, & Seidel, 2021; Taylor & Parsons, 2011) connections in two foundational areas that are rarely linked. Table 1 depicts the parallels and similarities of vocabulary across math and ELAR. It is important to note that many of these terms end up in the curriculum in Texas ELAR and Math classrooms, as this is vocabulary used in Texas' process and content standards found in the Texas Essential Knowledge and Skills (TEKS).

Table 1
Making Words Count Vocabulary

ELAR	**Mathematics**
Narrate/Narrative	Explain/Justify/Prove
Compare	Compare/Comparison/Similar

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Point of View	Frame of Reference
Sequence of Events, Chronological Order	Order, Order of Operations, Time, Date
Summary/Summarize	Algorithm
Inference	Estimating
Predictions	Predictions (sequence and patterns)
Critique, Analyze, Critical Thinking	Analyze, Critical Thinking
Fluency	Automaticity
Syntax (sentence composition)	Equation (a mathematical statement)
Characteristics (of characters, authors, plots, genres)	Characteristics (of shapes, dimensions, angles)
Visuals/Graphics	Pictographs, Picture Graphs
Text Set	Set (Collection of Objects)

At times, literacy and mathematics might seem like polar opposites; however, there are many ways in which their content and vocabulary can be connected within the same grade level. Examine the vocabulary in Table 1. The terms "narrative" (p. 6), "summarize"(p. 4), "inference" (p. 3), and "characteristics" (p. 3-4) are written in Grade 5 ELAR TEKS (Texas Education Agency [TEA], 2020). Terms such as "estimate" (p. 8), "justify" (p. 7), "explain" (p. 8), and "algorithm" (p. 7) are included in Grade 5 Mathematics TEKS (Texas Education Agency [TEA], 2020). These terms were paired in Table 1 due to their similarities. Students could be encountering lessons with these terms on the same days in different classrooms, yet not realize the relation. Estimation and making inferences require similar skills and thought processes, and they both require background knowledge. How can teachers make this connection across subjects? How can these terms be used to strengthen writing or create prompts in mathematics or ELAR?

Effective Writing Instruction and Integration Across Subjects

Effective writing instruction should consist of "constructivist, active learning methods" in which students are "expected to be active in the learning process" with teachers using "diverse approaches" (Toquero, Talidong & Liu, 2021, p. 4). Writing instruction should be developed to build confidence and build essential literacy and communication skills.

According to Graham and Harris (2013), students understand the material better when they can write it. It is also beneficial for students to write about concepts presented in classes such as science and other subjects, in which the students can record data, analyze, personalize, or grasp and connect key ideas from text (Graham

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& Harris, 2013). Such practices can make learning memorable and more meaningful for students, by getting them to engage with material in various formats and levels of thought and allowing them to connect with content.

Writing instruction in school classrooms has evolved, and teachers in literacy settings seemingly have exposure to many resources that can help them share exemplary writing instruction practices. But the reality is "the overall picture that emerged from the 28 studies reviewed was that writing instruction in most classrooms is not sufficient" (Graham, 2019, p. 280). One thing that supports this finding was that "a majority of teachers did not devote enough time to teaching writing" (Graham, 2019, p. 280). Time is often not devoted to writing instruction because even though it is a foundational skill, writing is not usually classified as a core subject like math, science, and social studies. In most of our nation's classrooms, core subjects are evaluated yearly using standardized tests, and in many states (such as Texas STAAR exams), promotion requirements are met through these tests. Writing is occasionally evaluated using these types of tests, but most are given every few years.

Attention to teaching writing skills and instruction is needed, and with classrooms becoming more diverse, the opportunity exists to bridge gaps and collaborate as professionals (as educators), and refresh students with new ways to reach and teach them. A start would be showing them how core subject content overlaps and that the skills that they learn and develop seemingly don't exist without the other.

Mathematics and Writing

There is little research (Rutherford-Becker & Vanderwood, 2009) available on the impacts and relation of literacy (specifically writing) and mathematics in the classroom. According to Schmoker (2018), writing and practice in using writing skills "can be easily integrated into the content areas by having students respond to simple, versatile questions, sentence stems, and prompts" (p. 2). Math and writing can be integrated to vertically align content areas; for example, students can express vocabulary and their thought processes while working on math equations or word problems. The expressiveness, (i.e. the ability to give open ended responses) in writing could also serve as "an opposing force to math anxiety because it increases self-efficacy" (Ruark, 2021, p. 6). Expressiveness is key, and it relates to self-efficacy—also an important aspect of literacy learning (Bandura, 1977; McCarthy, Meier, & Rinderer, 1985; Scott, 1996; Walker 2003; Grenner, et. al, 2021). Students have to build self-efficacy to believe in their abilities to achieve in math as well as writing. Students also need to know the purpose for writing and to believe that their instruction in core subject areas "count" in all areas of their academic journey.

Conclusion

Mathematics and writing are not traditionally paired in the classroom, but there are opportunities for educators to collaborate and integrate skills across both subjects. Vertical planning with other grade level teams across core subjects is crucial. Providing students with an integrated cross-curriculum approach moves classrooms toward being more relevant and equitable. Teaching approaches that are equitable should center on giving students options that are accessible, personal, and current. Giving students a voice, whether in math or literacy, works towards creating more innovative and critical thinkers—which ultimately helps all stakeholders—educators, students, and their communities (Baumert, et. al, 2010).

Good quality teaching is good teaching, no matter the subject. Making words "count" and writing across the curriculum in mathematics can move teaching and learning into a new realm of collaboration amongst educators, and provide students with more confidence in not one, but two potentially difficult subjects. Math

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and writing are foundational skills that need more interaction within curriculum. Educators need to have more conversations on teaching skills and content across subject areas, and to work as a team to tackle the issue of providing high-quality writing instruction (Graham, 2019; Graham & Harris, 2013; Zumbrunn & Krause, 2012) that is not limited or taught in isolation. Literacy is a "house" that is full of complexities, and it holds a foundation that should not be built in just one class or content area.

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