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Cory Quealy

St. John Fisher College, cquealy_no@sjfc.edu

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The Importance of Writing in Mathematics: Why Writing Allows for a Deeper understanding of the Mathematical Content

Abstract

When learning a new subject or course material, writing can be an essential tool for a deeper understanding of content. The importance of writing in mathematics is no different—yet in mathematics, writing seems to be the odd-ball out (exception). However, in classrooms where students have little depth of understanding mathematics, writing can be a vital instrument in the learning process. A common misconception when learning mathematics is that it is all numbers and memorizing equations—when in fact writing is a main component and first step to developing a deeper understanding of the mathematical content. As students continue to grow and mature mentally, their traditional reading and writing literacy increases.

*The Importance of Writing in Mathematics:
Why Writing Allows for a Deeper Understanding of Mathematical Content*

Cory Quealy

Abstract

When learning a new subject or course material, writing can be an essential tool for a deeper understanding of content. The importance of writing in mathematics is no different—yet in mathematics, writing seems to be the odd-ball out (exception). However, in classrooms where students have little depth of understanding mathematics, writing can be a vital instrument in the learning process. A common misconception when learning mathematics is that it is all numbers and memorizing equations—when in fact writing is a main component and first step to developing a deeper understanding of the mathematical content. As students continue to grow and mature mentally, their traditional reading and writing literacy increases.

Whenever I or anyone I have spoken to has thought about mathematics, many ideas may come to mind: You may think numbers, theories, algorithms, or a series of different items. People tend to think that mathematics is all numbers and memorizing equations—when in fact writing is a main component of learning and how people learn mathematics. I stumbled upon this question when I took my first college mathematics exam. Having studied all the equations, numbers, and techniques—I assumed I was ready. The teacher passed out the exam and I was bewildered. I thought to myself, “Where are the numbers, the equations, how do I use the techniques?” In fact very few, if any, of these aspects were on the exam. The exam consisted of definitions, and how would you do the problem—instead of actually doing the problem. So there I was, a lone math major trying to *write*

mathematics—absurd, I know. This is when I had my “Eureka!” moment. Writing is not solely for English class anymore—writing is for every subject. When you write, you learn. Writing allows you to have a deeper connection to the subject you are trying to learn. Simply going through the motions in mathematics will leave you unsuccessful and ineffective. This is why writing—especially in mathematics, is so crucial to being successful. The connections students make while writing in mathematics classes make for critical thinking, developmentally sound, and more productive learners.

Many students—even teachers actually, feel as if the implementation of writing in mathematics may be a useless and unnecessary aspect of learning the subject. Conversely, they could not be farther from the truth. To be able to reason mathematically is no simple task, trust me. However, when you write out the process of the mathematics you are learning, you can see how you got there. Writing in mathematics may seem like a daunting task, but it can be a helpful exercise to deepen your understanding of more than just techniques. Streeks (2013) says, “Too often in my math classes I see students going through the motions and sometimes getting the correct answer. I have always wondered if students really know why they are going through those motions” (1). This passage gives fantastic insight on what she is trying to get the students away from—going through the motions. “Writing encourages students to reflect on and explore their reasoning and to extend their thinking and understanding” (Streeks 1). Streeks (2013) is trying to get the students away from this

monotonous experience of just “doing the math” without the actual conceptual understanding necessary for true success in mathematics.

As my research continued, it became clearer that to have students develop higher success rates in math class, you need to show them why writing in mathematics is important and how it could help them as students. Just telling the students to write math will do nothing, but encouraging students to come up with a new way to solve a problem can be a rewarding and exciting experience for learners at any level, but especially at a younger stage of learning. Streeks (2013) also describes this interesting term, “expository writing.” Expository writing is writing that is intended to describe and explain mathematical ideas. It is the main component and a relatively new term in the mathematical world. Since writing in math is a fairly new concept, the ability to link expository writing to the writing you may do in an English class is essential in developing your writing literacy skills. Writing in mathematics is very hard—but also extremely important for the learning process. But now with this “expository writing” idea, it makes it even harder. It makes it harder due to the language and terminology that comes along with learning mathematics. To many, mathematics is an almost impossible task. However, just like everything else, it is a process.

Writing in all other disciplines has always been a key part of learning—but not in mathematics. From history to science, writing is a key part of conceptualizing and learning these disciplines—yet mathematics is left to die. But why should writing in mathematics be so different and isolated from this learning-rich experience? In *Integrating Writing and Mathematics*, the authors see that like history or science—

mathematics should be no different in the way we use writing to learn. Being classified as a top-five “hardest” college major by CBS News, mathematics should have started to incorporate writing years ago.

The ability to link mathematics with a critical learning exercise like writing is essential in the learning process. This new “discovery” of writing in mathematics should have been incorporated into classrooms years ago. This idea of integrating writing in mathematics is best evaluated when Wilcox and Monroe (2011) say “...the quality of student discussion of mathematics during lessons was richer when students were expected to write” (522). When you have students writing about math, they can not only see where the math they did is coming from, but also where it may be heading. Since mathematics is very much cumulative, the idea to see where it may be heading is crucial while learning it. “Note-taking/note-making honors both writing and mathematics. It encourages students to make connections between new concepts and previously-learned material and their personal experiences” (Wilcox and Monroe 525). This passage truly allows insight into why writing in mathematics is so important. When you can get children to make personal connections to math and their own life experiences, it becomes a critical point for them during their learning process. It is where they finally have that “ah-ha” moment and that light bulb flicks on. That is learning.

Now that the integration of mathematics has been discussed, the more important part comes about: applications of writing in mathematics. To talk about writing in mathematics is one aspect, but to have people actually provide and follow-through with these implications of writing is a separate issue. One teacher, Amy Cooper,

decides to put a plan into action by using technology to enhance writing in the mathematics classroom and beyond (Cooper, 2012). When students can find means to write, their understanding of the content becomes clearer. Also, when you add in chat rooms, forums, and blog postings from other students and teachers, and they help a student with a certain issue they may be having, it helps to have such guidance available when the student may need extra help outside of school. When Cooper says, “As students make posts and read comments after school, in the evenings, and on weekends, they increase their interactions time with the course,” she is really driving home the point of “extra help” (83). Not being able to provide enough extra help can be a huge downfall when teaching student’s mathematics, but allowing posting online and having that digital feedback for a student might be a saving grace for their mathematics course. Allowing for extra interaction from the students by using chat rooms, blogs, and forums can be positive for students as they may increase their development and understanding for certain course material that they may have not picked up during class.

Teachers all across the world are recognizing the fact that mathematics should not be so abstract—this is where the writing part comes in. Writing in mathematics, about mathematics, and for mathematics is helpful in the growth of a student’s mathematical abilities. “Students’ mathematical literacy does not exist in a vacuum. While students use writing to increase their mathematical literacy, a natural by-product is growth in reading and writing literacy as well as in critical thinking” (Cooper 83). Here, Cooper makes an exciting point: As well as increasing your reading and writing ability by reading and

writing—you are also increasing your mathematical literacy due to reading and writing about the mathematics.

Amy Cooper is seen as a pioneer in the math and writing world as her ability to implicate a difficult system and develop an online resource for her students made her break away from the traditional style of teaching both mathematics and writing. Like Cooper, Professor Mika Munakata, a math teacher at Montclair State University in New Jersey, also saw a window of opportunity to break away and create more intelligent and literate students who not only went through the motions of math but understood the “why?” (Munakata, 2005). When people think of the “traditional” style of teaching mathematics, one may think of a lecture style. Very seldom when people, especially students, think of math class do they think of a highly interactive, enjoyable, and learning-rich experience. In fact, many thoughts may be just the opposite. However, Professor Munakata took the initiative to try and make learning mathematics for students anything but traditional. He saw the importance of writing and how it can help you learn a plethora of subjects, not just English. He saw that through writing—learning occurs, and it can also allow for a deeper understanding of certain concepts that do not just happen to be techniques. His main concern was to incorporate effective pedagogical instruction in the liberal arts area of mathematics.

Professor Munakata saw the issue: non-mathematics majors taking a general education math class and just trying to “get by.” He did not want students to just learn the techniques; he wanted the students to learn the math and the concepts that go along with the techniques. In fact, surprisingly, students were very happy with this new way of learning math. “The

responses were overwhelmingly positive. Students stated that the book club idea was a new way of learning about mathematics and the history of mathematics. They liked the break from traditional lecture-style courses, enjoyed meeting in small groups and discussing a common topic” (Munakata 259). Learning math is hard—very hard, especially college mathematics. Therefore, to have a professor break from tradition to teach such a hard and demanding subject is essential in the learning process. Some students cannot learn simply by lecture, and the students taking a general education math class probably do not even want to be there. However, reading math, writing about math, and then doing the actual math can be an easier way to learn it—and actually know the concepts of how they obtained their answer.

Writing in all academic disciplines has always been a tool used for the learning process. Until recently, mathematics was absent in that aspect. However, more and more teachers, professors, and students are realizing the importance of how writing in mathematics can be such an essential instrument to learn and help conceptualize mathematical ideas. As writing in math classes becomes more widespread, students will develop the ability to approach problems in ways they may have never seen before. While students write, they can see different angles they can use to learn the mathematics in a slightly new way. Constantly going through the motions to “get by” in math class is no longer producing successful and effective math students, or any other students in general. Math students are now being expected to write to learn—but many of them must first learn to write. Deeper understandings and conceptualizations of mathematical ideas are no longer the by-product of “going through the motions.” Developing critical thinking

within highly-effective math students is not an easy task; they must learn to see the deeper connection that writing in mathematics provides, which is the reappearance of ideas and then how your methodology to approach those ideas changes.

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