

Writing and Story Telling as an Aid in Learning Math

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ABSTRACT

It might be said that story telling is the oldest form of teaching and learning in which early humans discussed the important questions by passing down stories from generation to generation. This paper discusses the nature of literature in math education with a sample poem and story.

Keywords: storytelling, literature in math

INTRODUCTION

*One little bee flew and flew.
He met a friend, and that made two.
Two little bees, busy as could be,
Along came another and that made three.
T/hree little bees, wanted one more,
Found one soon and that made four.*

(and so on)

You see what's going on here, don't you? By the time we reach the advanced age of three we are already learning about numbers through nursery rhymes, in this case about five little *Apis mellifera* in the children's verse *Five Little Bees*¹. For a child, the soothing rhythm of words in story form delights the child, resulting in learning and retention of the often less than exciting subject of arithmetic.

I myself, as a child, was given a "multiplication assist" when my mother recited catchy cadences like

six times eight fell off the plate, that's what makes it forty-eight

To this day, if you asked me for the product 6×8 , this catchy little verse is likely to pop up somewhere in the recesses of my brain. My mother also asked me to create my own verses to learn addition and multiplication tables, which was an enjoyable exercise, and to this day I can tell you a dozen or so words that rhyme with the number 9.

LINKING MATH AND WRITING AT AN EARLY AGE

Educator Paul Estes (1987) tells of visiting Germany and observing the integration of writing and mathematics in the *first grade*. He observed a first-grade teacher morphing the following sentences, from natural language to the language of mathematics, a task which is the bane of students of mathematics when trying to solve the notorious word problems.

Half of ten is five.

Half of 10 is 5.

$\frac{1}{2}$ of 10 = 5

$\frac{1}{2} \times 10 = 5$

Half of six is three.

Half of 6 is 3.

$\frac{1}{2}$ of 6 = 3

$\frac{1}{2} \times 6 = 3$

¹ Oral tradition poem, author unknown.

Contribution of this paper to the literature

- The poem and story in this paper are intended to illustrate how poetry and storytelling can motivate early learners of mathematics. The references at the end of the paper will also aim the reader towards useful online sources.

POEMS ABOUT MATHEMATICS

Once a child reaches adolescence, the use of literature as an aid in presenting mathematics takes a more mature form. There are a variety of books by prominent mathematicians that can be found on the internet that present mathematics in entertaining varieties. The following poem presents a colorful history of mathematics for middle school and high school students. Students can also make their own poetic contributions to mathematics.

THE ORIGIN OF MATHEMATICS

Some say the Babylonians started it all when they realized there was more to life than growing tomatoes, cabbages, and cucumbers.

So, they started scratching out wedge-shaped symbols on little clay tablets, which eventually turned out to be our present-day numbers.

Yes, some will argue mathematics began along the Tigris and Euphrates in old Babylonia,

Although there are those who argue it began with Thales of Miletus along coastal Ionia.

Now others will say mathematics began with Pythagoras, Archimedes and a few other Greeks,

Although more than one Hindu will say it began with the Sikhs.

But wouldn't you agree it's rather puerile.

If we didn't at least consider the Nile

And who would ever want to displease,

Wu Wang, Huang-tese and a billion Chinese.

But I think if the history of math were accurately told,

Of the first man and woman who spun numbers from gold

We'd have to go back past Greece and the Nile.

Beyond India and China by a country mile.

Past Moses, Noah, and the Queen of Sheeba,

All the way back to Adam and Eva.

KEEPING AN ACADEMIC JOURNAL (HIGH SCHOOL AND COLLEGE)

A few years ago, as a university professor, I asked the students in a beginning calculus class to keep a scholarly journal, where during the final five minutes of each lecture, they would make daily entries in a journal, where summarizing what they had just learned or not learned during the lecture. The journal would be private and not read, if so desired, by anyone other than the student and would be a permanent record of the student's thoughts over the course of the term.

When I first informed the class of my plan, I was met with the usual groans from the class, but I tried to inspire the student by pointing out that many of the great scientists and scholars throughout history, like Darwin and Wallace, kept detailed diaries of their observations, which turned out to be critical to their discoveries.

I told them the main purpose of the journal was to "learn by writing" where they would sum up the contents of the lecture. The writing style was not important and journal entries could include as many questions as answers. I suggested that the journal be of sufficient quality that they would want to keep it for the remainder of their college career, and possibly longer.

During the first week of my proposal when it was time for the students to make their entries, most would more or less look around the room, waiting for the final bell to sound. However, after a week or so, they gradually had a mind shift and bought into the idea, whereupon they eagerly took out their journal and added their thoughts of the day.

At the end of the semester when the class evaluations were filled out, I was amazed that many students raved about the journal and went so far to say that it was the most useful activity they had yet participated in during their

college careers! Some even said they planned on continuing the practice in other classes, whether or not the instructor suggested its practice or not.

REWRITING THE TEXTBOOK

In addition to keeping a journal, I sometimes assigned the student to rewrite some of the material in the math textbook and attempt to write some portion of the book in a more understandable (and interesting) way and then read their results to the class, which often leads to a lively discussion. The students generally buy into this challenge since students often complain about their textbooks, saying they are boring and confusing, and this challenge gives the student an opportunity to "put their money where their mouth is," and of course get a deeper understanding of the material.

MOTIVATIONAL STORIES ABOUT MATH

Although the world of numbers is not an easy sell to many children, the world of storytelling is always popular. Literature, related to mathematics is a vehicle able to take a young reader on an imaginative journey, without the child realizing that mathematical understanding is being transmitted. Stories with some math content can show connections between everyday life and mathematical objects like numbers and geometric shapes. One suspects that students who are taught mathematics with connections to storytelling become better problem solvers for problems related to the real world.

The following "math story" aims to not only motivate students, but also help rebuff the spurious claim that girls aren't good in math.

THE GIRL WHO ATE EQUATIONS FOR BREAKFAST

I'd like to tell you the story of Bugs Maxwell. The first thing you should know about Bugs is she wasn't your everyday small-town girl. Even her name suggested something different. It might be said every small town has a Bugs Maxwell. The fathers in our town said she was a bad influence on us boys and called her trouble. The mothers called her by other names. I called her every night, for you see, Bugs had a bad reputation. *She was a mathematical genius.*



Figure 1. Luckily, no one suspected

The story began when our 6th grade teacher, Miss Tartaglia, organized a Math Bee, which is the same as a Spelling Bee except impossible words are replaced by impossible math problems. You miss a problem, you sit down. The last person standing is the winner.

On the surface, an activity like this would appear harmless, but beneath the surface, social unrest was starting to fester, and it was my old nemesis and grade-school spitball target, Melva Snooks, stirring the pot. Melva and her cabal of comrade-ettes decided to use the Math Bee as a cause *célèbre* for female equality. Lord knows, Melva was as dumb in mathematics as us boys, but she had street smarts and knew enough to realize the girls had an ace-in-the-hole -- Bugs Maxwell.

Of course, there was no way the girl champion would ever compete with the eighth-grade boy genius, Tyler Harrington. Just the thought of a girl beating Tyler Harrington sent us boys into convulsions of laughter.

It was now perfectly clear that Melva and her Sisterhood of Suffragettes were going to use the Math Bee as a battering ram to crush our long-won superiority in mathematics. In the lower grades, mathematically-smart girls were kept in line by us boys and never caused any problems, but now controlling them was like herding the proverbial herd of cats, only herding cats was a lot easier. What worried me about the whole affair was I knew Bugs was a mathematical genius. After all, she had been holding me up in mathematics classes for my entire academic career. It was for that reason I had an ethical dilemma of whether to show Bugs some loyalty for her years of help, or join the Tyler Harrington forces. Male bonding prevailed, however, and I dropped her like a hot potato.

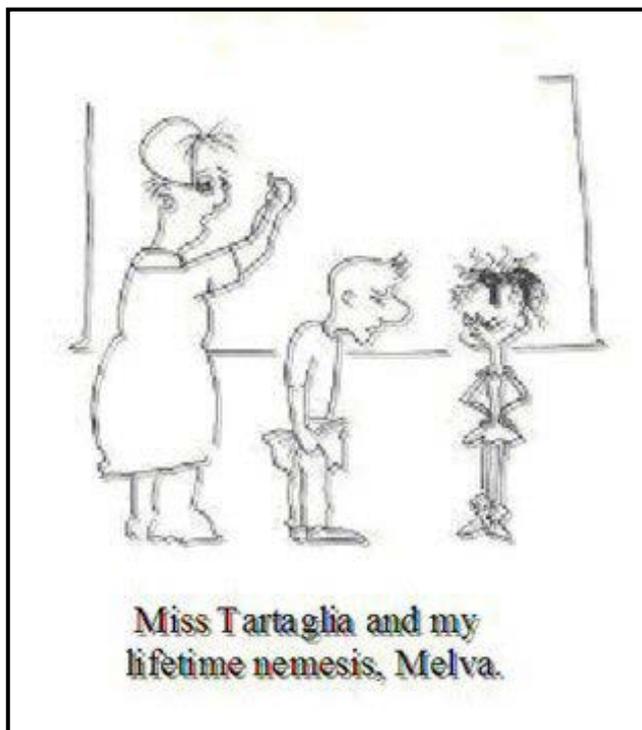


Figure 2. Miss Tartaglia and my lifetime nemesis, Melva

On the last day of school Miss Tartaglia dragged in the parents to see the big affair, where the sixth-grade class was mustered on a large stage. I stood next to Bugs, knowing she'd probably answer one of my misses, making the whole affair a double disaster.

The first question Miss Tartaglia asked went to Fraser His Foulness, so named for his enviable ability to see vulgarity in any situation. The question was some simple-minded thing like "What is 4 plus 3 divided by 2?" Fraser wrote on his pad of paper for about five minutes and then answered, "No." Miss Tartaglia rolled her eyes and told him to sit down. I smiled to myself, knowing even I could have gotten that one right. I could also hear Bugs chewing her gum. I also knew she was smiling.

The next few candidates also bit the dust as Miss Tartaglia reeled off questions that would have stumped the average rocket scientist. "What is 160 plus 16 divided by 4 plus 7 minus 3 divided by 9," she rattled off faster than a snake-oil salesman. The woman had no mercy.

Finally, she came to Tyler. The audience grew quiet.

"What is the *Pythagorean Theorem*?" she asked. She took out a tough one for Tyler.

"It says that the sum of the squares of the two legs of a right triangle is equal to the square of the hypotenuse." Tyler said without batting an eye.

"Correct." Tyler's fans grade gave a sigh of relief. My sigh was short-lived, however, since I was the next turkey on Miss Tartaglia's chopping block. I just stood there awaiting the worst, listening to that chewing of gum.

"What is the solution of

$$x^9 + xy^5 - xyz^3 - yx = cat$$

Miss Tartaglia asked with Dickensonian cruelty. Whoa! A surge of adrenaline the size used to sedate brewery horses ran through my veins. Miss Tartaglia glared down at me from her perch behind the podium.

"Uh, uh, uh, uh,"

"Time's up, sit down." Discredited, I slunk off the stage. The only thing I could hear as I left the stage was the pounding of my heart. And, of course, that damn chewing of gum.

"Ok, Miss Maxwell, I'll give you the same equation as I asked Mr. Farlow, what is the solution of

$$x - 1 = 0$$

Bugs smiled as if to say she had hoped for something more challenging.

"One," she answered, smiling all the while.

"You #%^&#," I could hear Fraser His Foulness cussing behind me. I was thinking the question seemed a lot harder when she asked me.

Well, it didn't take long for the pretenders to disappear from the stage. The number had shrunk to two. In one corner, stood the last bastion of male mathematical superiority in the 6th grade class, Tyler Harrington. In the other corner, a tiny waif of a thing, a single pigtail hung down the the middle of her back, chewing on a wad of gum. Like our fathers said, *stay away from her, she'll give you nothing but trouble.*

"Ok, Mr. Harrington," Miss Tartaglia said as she opened her purse and took out an envelope. A collective gulp could be heard from the audience. We all knew that ol Tartaglia was not pussyfooting around any more. She was getting out the good stuff, not the baby stuff she asked the rest of us bozos. Finally, Miss Tartaglia asked, "What is the next number in the number sequence

$$1, 3, 8, 15, 24, 35, ?$$

"48," Tyler said without batting an eye.

"Right," Miss Tartaglia said.

A collective sigh of relief went up from the boys of the eighth grade. We didn't know what the question was, but we still gave a collective sigh of relief.

"Ok, Miss Maxwell, can you give me the next value in the number sequence

$$1, 2, 3, 5, 8, 13, 21, ?$$

All of us boys detected a faint smile cross Tyler's face as the question was asked. The taste of victory was close at hand.

"Oh, the Fibonacci sequence, it would be 34," Bugs said as she continued chewing her gum.

Her answer wiped the smile off Tyler's face.

"Ok, it's back to you," Miss Tartaglia said looking towards Tyler. "What is the solution of the equation

$$x^2 - 625 = 0$$

The audience was so quiet you could hear a pin drop. The only thing you could hear was that damn chewing of gum. I could hear Fraser His Foulness behind me saying that if Tyler answered that question he should get the "bleeping Noble Prize." Finally, Tyler gave his answer, "25".

"Correct," Miss Tartaglia said. "Now for you, Miss ...

I've never seen anyone interrupted so fast. Bugs' chewing stopped, her smile vanished, and Miss Tartaglia and the audience were stopped dead in their tracks.

"I'm sorry but that isn't the correct answer," Bugs said. "The equation has two solutions, plus 25 and minus 25."

"Minus 25," I thought to myself, "What's she talking about?"

"Uh," Miss Tartaglia said, "We really didn't go into negative solutions of quadratics this year, that's next year's material. I'll have to let our visiting judge, Professor Birdhatcher, settle this matter." Professor Birdhatcher was a professor of mathematics at State University and often volunteered as mediator at our school, and was sitting in the back row. All heads turned as he rose.

"You can't argue with mathematics," he said. "The young girl wins."

The fall of Pompeii couldn't have been more devastating than the fall of Tyler Harrington and the citadel of male mathematical superiority. I can still see the obscene spectacle of Melva and a horde of sixth-grade girls charging onto the stage. Tyler Harrington slunk out a side exit just in time to avoid being stampeded by the charging gaggle. I could hear Fraser His Foulness cursing up a blue streak behind me.

"That bleep-of-a-bleep," he was saying. I didn't know if he was talking about Bugs, Tyler, Miss Tartaglia, or even Professor Birdhatcher, but I suspect he had a word or two for everyone.

I just then looked up to see Bugs being mobbed by her admirers. She just stood there smiling contentedly and chewing her gum. Then I realized she was doing more than smiling contentedly and chewing her gum. *She was looking straight at me!* A chill ran down my spine as I suddenly realized just what she was thinking. She was

thinking, how in hell is that old Benedict Arnold ever going to make it through seventh-grade algebra without her. And brother, she wasn't the only one.

SUMMARY

The author has written a number of books (Farlow, 2016a-2016d), published by Thales House Press, intended to fascinate readers of all ages and mathematical abilities in the world of mathematics.

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