Literature in the Mathematics Classroom: The Case of Mr. Bowditch

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Imagine yourself in a mathematics classroom full of students:

- How are the students engaged with the subject matter?
- What type of classroom discussions are taking place?
- How does the teacher facilitate such conversations?
Goals

- Determine the advantages of utilizing children's literature in mathematics classrooms.
- Connect children's literature to mathematics and the Standards for Mathematical Practice.
- Use literature to bridge different content areas together.
Literature in Math Classrooms

- How it all started: reading an engaging book and connecting it to the mathematics.

- The use of children’s literature enriches learning as the mathematics and language skills develop simultaneously as students listen, read, write, and talk about mathematical ideas, allowing students to participate in their own mathematical development (Rodriguez, 2008).

- Literature in conjunction with what is taught in school is able to merge imagination and concepts to what is being learned in school (Mink and Fraser, 2005).
Carry on Mr. Bowditch

- Found in almost every school library.

- Received the 1956 Newberry Medal recipient.

- Connects different content areas, including social studies, science, literature and mathematics.

- Appropriate for upper elementary and middle school students
Carry on Mr. Bowditch

- Fictionalized biography of Nathaniel Bowditch – one of America’s first mathematicians.

- Takes the reader on a journey through his accomplishments in mathematics, astronomy, and navigation in Salem, Massachusetts, in the late 1700’s and early 1800’s.

- When faced with an obstacle in his life, he learned to “sail by an ash breeze”.

- His book, The American Practical Navigator, is still “the sailor’s bible" and a standard text used by the United States Naval Academy since 1867.
Connections to Mathematics

- Mathematics is discussed throughout this book, but not as merely a series of formulas and procedures.

- Mathematics plays a significant role in the pursuit of his dreams and solving life situations.

- The reader can see the integral role of mathematics in the various aspects of Nathaniel’s life.
Connections to Mathematics

Quotations

- Nat tells a girl she has grown twice as pretty every year for 11 years. The girl exclaims, “Goodness! I’m twenty two times as pretty!” and Nat corrects her to tell her she is $2^{11} = 2048$ times prettier. The girl responds, “You mathematician! I wish you could at least pay a compliment without arithmetic!”

- “See! That’s mathematics! It should give you the right answer!”

- “That’s the beauty of mathematics. It’s exact.”

- “Mathematics is nothing if it isn’t correct! Men’s lives depend on those figures!”

- “If we had logarithmic tables of all the trigonometric functions, you could work any problem in navigation with nothing but addition and subtraction.” “Log tables? I make them,” Lupe promised, “with the wood!”
Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.
Connections to Other Content Areas

- **English/Language Arts**
  - Students can demonstrate comprehension of fictional texts, narrative nonfiction, and poetry.

- **Social Studies**
  - Student can demonstrate skills for historical and geographical analysis and responsible citizenship, including the ability to distinguish between parallels of latitude and meridians of longitude
  - Students can describe life in the New England, Mid-Atlantic, and Southern colonies, with emphasis on how people interacted with their environment to produce goods and services, including examples of specialization and interdependence

- **Science**
  - Students can plan and conduct investigations using the tools that Nathaniel Bowditch used to develop his scientific reasoning, logic, and his understanding of the nature of science.
Building a Sextant in the Classroom

- A sextant is a tool for measuring the angular altitude of a star above the horizon.

- The aspects of navigation and sailor’s tools can initiate a rich discussion of mathematics and implications for astronomy.

- Bowditch took lunars (a way to find latitude using the stars) to find his locations at sea.

- Using a sextant, Bowditch measured the height of a star above the horizon, and used the star’s height (or altitude) gave him the ship’s latitude.
Building a Sextant in the Classroom

1) Tie a washer or three paper clips to one end of the string. Tie or tape the string to the midpoint of the protractor, so that the string falls across the 90 mark. The string is called a plumb line.

2) Tape the protractor to the ruler to within an inch of the end of the ruler.

3) Sight an object by placing your eye at one end of the ruler. The protractor will be upside down and the plumb line will hang down as seen in the picture.
Goals

- Utilize children’s literature in mathematics classrooms.
- Connect children’s literature to mathematics and the Standards for Mathematical Practice.
- Use children’s literature to bridge different content areas together.
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