



Nathaniel Bowditch

Math, Science and Social Studies

A Curriculum Designed for Grades 5-9

Curriculum developed by
The Bowditch Initiative of Historic Salem Inc.
in partnership with the House of Seven Gable Historic Site
Salem, Massachusetts
2001



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The Board of Commissioners of Trust Funds and The Marine Society At Salem

**The Marine Society
At Salem**



**The Boston
Marine
Society**

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...as a dramatic writer throws himself successively into the character of a drama, he is composing that he may express the ideas and emotions peculiar to each other, so the mind of a teacher should migrate, as it were, into those of his pupils to discover what they know, and feel and need; and then supply from his own stock what they require, he should reduce it to such a form and bring it within such a distance that they can reach it, seize it, and appreciate it.

Horace Mann, 1840
The Art of Teaching, The Aptness to Teach
p. 16,17

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NATHANIEL BOWDITCH



INTRODUCTION

The story of Nathaniel Bowditch, mathematician, astronomer, navigator, and actuary, is the story of post-revolutionary America and the achievements of one man during this remarkable period in our nation's history. Nathaniel Bowditch, a self-educated, mathematically-gifted young man from Salem, Massachusetts, was born in 1773 into poverty. Although his early opportunities in life were extremely limited, Nathaniel's contributions to the new nation would later overshadow the difficulties of his childhood. For example, Bowditch's revision and recalculation of more than 8,000 mathematical errors in British navigation tables was a mammoth-sized task even now largely unheralded except by navigators. His publication of the revised tables in *The New American Practical Navigator* saved countless ships from fatal navigational errors, thus assuring their safe and swift arrival to their destinations. The now *American Practical Navigator* is in its 75th edition, and still relied upon by the United States Navy.

Bowditch displayed exemplary qualities in mathematics and science. His inquisitive mind sought patterns and solutions in everything around him. This search for order was particularly acute in his study of astronomy and navigation. He also displayed a flair for other languages, translating

Sir Isaac Newton's *Principia* from Latin to English, and later translating and revising Pierre La Place's *Mécanique Celeste* from French to English. These monumental works in physics and astronomy were now available to the new nation and its growing scientific community.

Nathaniel was also a natural teacher. His aptness for simplification of advanced mathematics achieved great acclaim from the sailors aboard his ships. Willing seamen were taught the complexities of celestial navigation, mastering even the difficult lunar calculations essential for determining longitude. The standard method for calculating lunars was greatly improved by Bowditch. These new lunar calculations of longitude aided countless sea captains, as the recently invented chronometer was still far too expensive for most captains to purchase.

The life and accomplishments of Nathaniel Bowditch are reviewed and modeled in the following mathematics and science curriculum for middle school students. Four themes from his life-long accomplishments were selected to focus the math/science units. These unit themes are as follows: historical context, patterns, simplification, and self-education. The accompanying lesson plans include Bowditch and Salem, Bowditch the Mathematician, Patterns in Mathematics, Patterns in Astronomy, Patterns in Architecture, Math Simplification, Mathematical Skills and Habits, and Navigation.

Preparation of this curriculum revolved around the Massachusetts Curriculum Frameworks for grades 5-9. Mathematics, science, and social studies frameworks pertaining to each unit are provided. The units and lesson plans are interdisciplinary and unsequenced. Teachers may select one or all lessons in any order to best fit their curriculum needs. Some units can be expanded, particularly the astronomy unit. The analysis of star data and creation of a student almanac provide many more possibilities for lessons beyond the current material. These lessons lend themselves to technology. Students can create spreadsheets, graphs, and graphic presentations (example: Excel and PowerPoint) from the data provided.

Middle school students enjoy real-life stories of personal accomplishments. Advances in math and science are all based on the accumulation of personal stories of victories, upsets, disappointments, and unexpected discoveries. The Nathaniel Bowditch story is a narrative of our early nation and one talented individual who persevered to overcome poverty, subsequently contributing greatly to the lives of others. It is a story well worth adding to our nation's treasure chest of heroes.