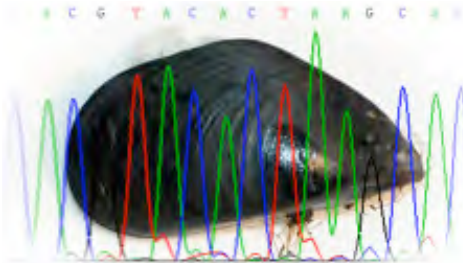


# Marine Biotechnology and Bioinformatics



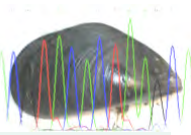
A program of ITEST (Information Technology Experiences for Students and Teachers) funded by the National Science Foundation



## **STEM Careers in Marine Science: Focus on the Middle School Student**

Elizabeth A. Karzag

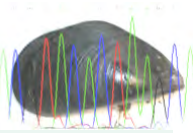
Piedmont Middle School, San Jose, CA



# Background Context

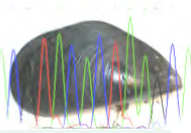
- ▶ Explore STEM Careers in Marine Science
- ▶ Expose Middle School Students to the Marine Scientist environment
- ▶ Extensive Planning Enhances interest in STEM careers in Marine Sciences





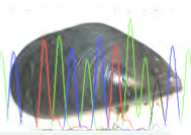
## Instructional Goal

- ▶ The project goal is to provide middle school students with exceptional experiences and connections for STEM careers in Marine Science.
  - Use my website to find links to marine science careers!
    - <http://www.berryessa.k12.ca.us/piedmont/site/default.asp>



## State Standards

- ▶ This project addresses the following California State Standards:
- ▶ 7. Scientific progress is made by asking meaningful questions and conducting careful investigations.
  - ▶▶ 7.a., 7.b., 7.c., 7.e., 3.a and 3.e can be found at :  
<http://www.cde.ca.gov/re/pn/fd/documents/sci-stnd.pdf> pages 23 and 24.



# Instructional Objectives

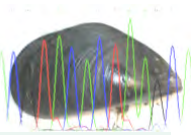
## ▶ Objective 1

- ▶▶ Discover the names and titles of various Marine Science scientists and professionals.

## ▶ Objective 2

- ▶▶ Recognize various responsibilities of Marine Scientists.





# Instructional Objectives

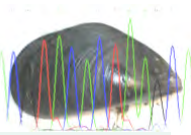
## ▶ Objective 3

- ▶▶ Understand the uses of various vessels used in marine science explorations.

## ▶ Objective 4 title

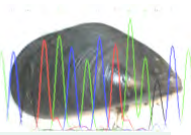
- ▶▶ Find websites, use links and complete online surveys.





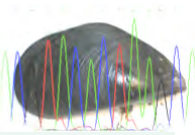
# Materials and Resources

- ▶ 126 lab notebooks
- ▶ 136 ID tags
- ▶ \$1000.00 for buses
- ▶ Digital cameras
- ▶ Permission slips
- ▶ Bus Contract
- ▶ Backpacks, any type of beach weather clothing
- ▶ Lunches, snacks, water
- ▶ Piedmont Middle School website
- ▶ SurveyMonkey registration
- ▶ MLML websites/links
- ▶ Textbook
- ▶ MBARI website
- ▶ Monterey Bay Aquarium website
- ▶ Dr. Simona Bartl



# Instructional Strategies

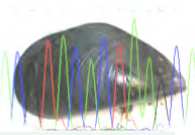
- ▶ Students learn about historical and current scientists
- ▶ Students use library and electronic resources to research STEM careers
- ▶ Students are introduced to Life Science State Standards
- ▶ Students experience a 4-part field trip to MLML, Moss Landing Marina, Salinas State Beach and Salinas River



# Field Trip Explorations



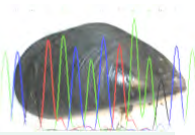
Lesson Title



# Marine Biotechnology and Bioinformatics 2007-2008



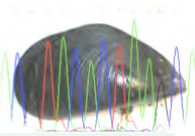
Lesson Title



# Marine Biotechnology and Bioinformatics 2007-2008



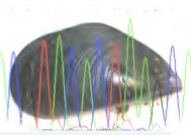
Lesson Title



# Marine Biotechnology and Bioinformatics 2007-2008



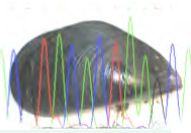
Lesson Title



# Native vs Invasive Species

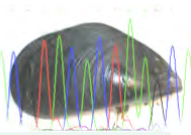


- ▶ Students view low tide and listen to a MLML graduate student for on the spot science!
- ▶ Students see thousands of invasive species!



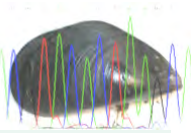
# Assessment

- ▶ Students kept journals for all pre-field trip research
- ▶ Students took a pre and post-field trip survey and wrote in specific learning outcomes.
- ▶ Students demonstrate learned outcomes by preparing electronic, written, oral or “Poster” representations of Marine Science careers.
- ▶ Analysis of the pre and post surveys of the “control” and experimental groups reveal understanding and learning of the various careers in Marine Science.



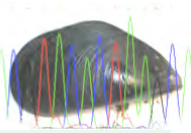
# Learning Outcomes

- ▶ Survey results: Greatest influence for learning:
  - » Talking with scientist in the laboratories
  - » Dr. Bartl's presentation of field scientists
  - » Beachcombing as a scientist and making observations
  - » Learning about native vs invasive species
  - » Seeing all of the remains of marine life hanging on the walls and in the MLML laboratories
  - » The tour of the Vertebrate and Geological Oceanography labs
  - » Being able to share their field trip with others



## Lessons Learned

- ▶ Students are eager to learn when presented with active learning lessons
- ▶ Students cooperated completely as pre-selected group
- ▶ Students crave field and relevant experiences for learning
- ▶ Students rate Pre and Post activities as valuable learning experiences



## Contact

- ▶ For more information about this lesson, contact:
  - ▶▶ Elizabeth (Liz) A. Karzag
  - ▶▶ Educator
  - ▶▶ Piedmont Middle School, San Jose, CA
  - ▶▶ [elizabeth.karzag@berryessa.k12.ca.us](mailto:elizabeth.karzag@berryessa.k12.ca.us)