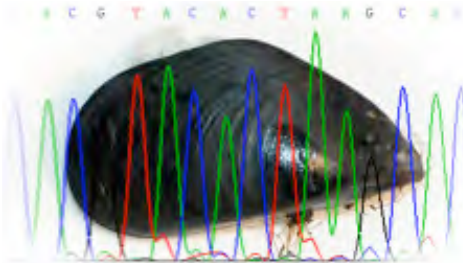


Marine Biotechnology and Bioinformatics



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

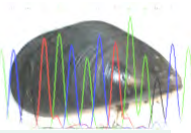


Codon Bracelets & Open Reading Frames

5th Science

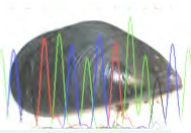
Pennie A. Perkins

Curtner Elementary, Milpitas, CA



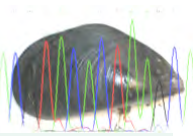
Background Context

- ▶ Open Reading Frames is a tactic for determining which segments of DNA actually code for a protein and therefore might be genes.
- ▶ Investigating mutations within the genetic code helps to understand biodiversity and adaptation through natural selection in a changing world.



Instructional Goal

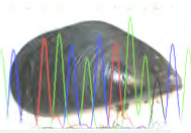
- To investigate possible amino acid sequences from nucleotide bases. Once the symbol for their amino acids has been identified on the chart provided on the worksheet, students will research two of their amino acids on the Internet. Completion of activity is when students determine all combinations and answer analysis questions on worksheet.



Marine Biotechnology and Bioinformatics 2007-2008

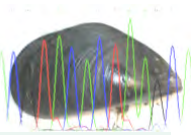


Codon Bracelet & Open Reading Frames



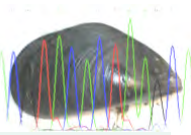
State Standards

- ▶ Grades 4-6: Life Sciences 2a, Experimentation & Investigation
- ▶ Grade 7: 2e, 3a
- ▶ Grades 9-12:
 - ▶▶ 1b, 1d, 1h
 - ▶▶ 4a, 4b, 4c, 4d, 4e
 - ▶▶ 5a, 5b, 5c, 5d, 5e



Materials and Resources

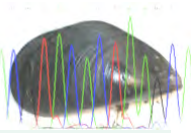
- ▶ Lettered beads (A, T, C, G)
- ▶ Twine
- ▶ Scissors
- ▶ Codon Bracelet and ORF Worksheet
- ▶ Computers
- ▶ *California Science/5*
- ▶ <http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/A/AminoAcids.html>



Instructional Strategies

Introduction

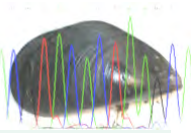
- ▶ Ask students to define mutation...give examples. Misconception: All mutations are negative. In the living world, changes in the genetic code result in numerous variations of species. As a result, there are positive, neutral, and negative mutations.



Instructional Strategies

Introduction

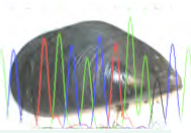
- ▶ Review vocabulary pertinent to codon activity.
- ▶ Students will you utilize the computer lab to complete vocabulary worksheet.



Instructional Strategies

Exploration

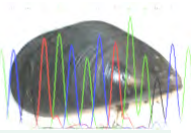
- ▶ Students will be given a list of applicable vocabulary terms prior to the lesson. Using the vocabulary, the objectives of the lesson will be reviewed. Materials will be introduced and set up in four stations with lettered cups and twine.



Instructional Strategies

Exploration

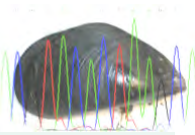
- ▶ Review the term “random” and its relativeness to genetics. After students have created their bracelet, they will begin to decode their codons using the chart on the worksheet.



Instructional Strategies

Exploration

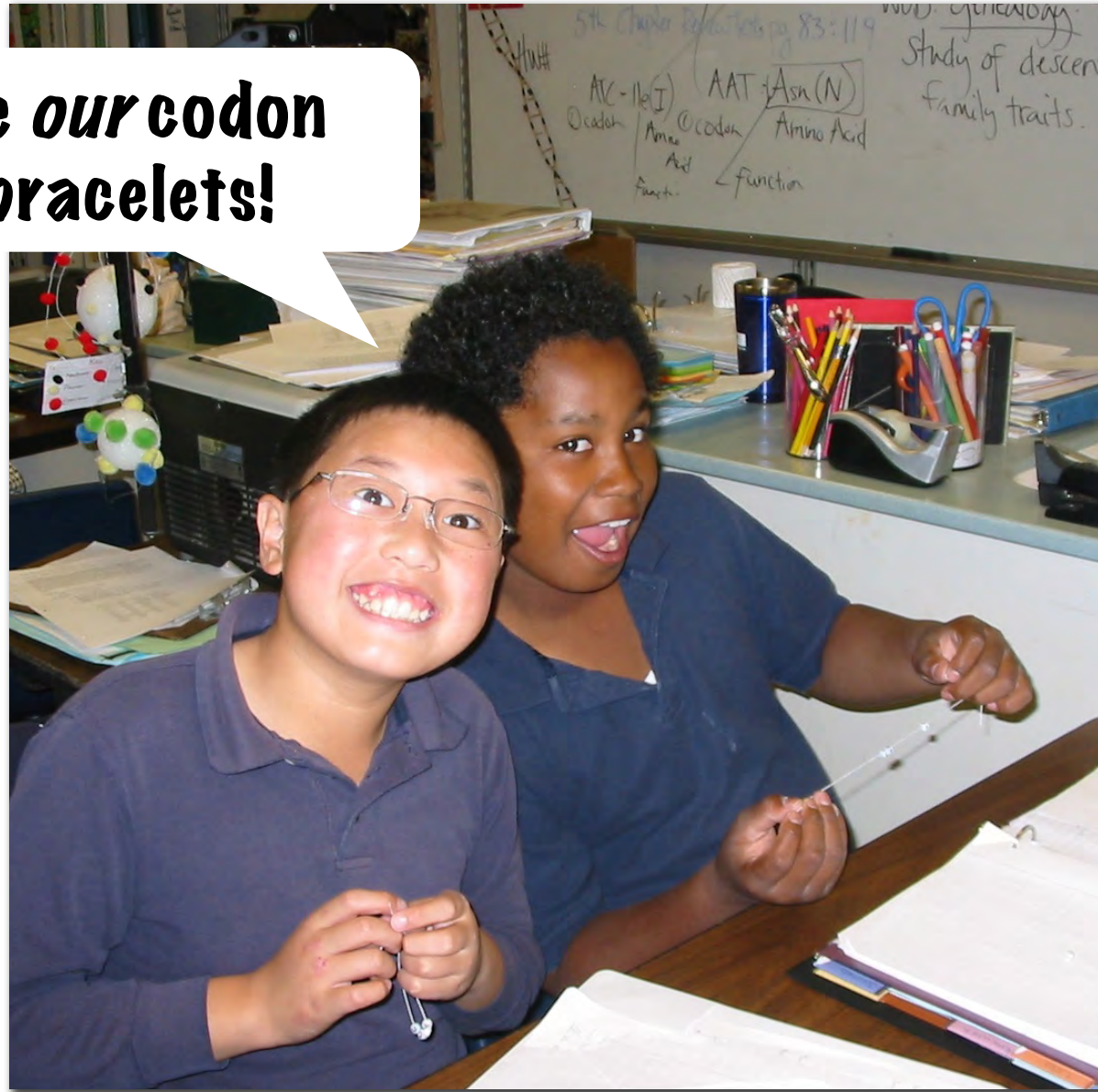
- ▶ Once students have identified all possible amino acid combinations, students will answer follow-up questions in class and finish research component in the computer lab.



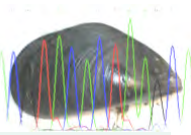
**Look! We made
codon bracelets!**

Codon Bracelet & Open Reading Frames

See *our* codon bracelets!



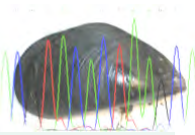
Codon Bracelet & Open Reading Frames



Instructional Strategies

Application

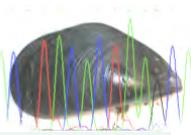
- ▶ Follow-up activity would be to complete a computer generated ORF activity.
- ▶ Interview Project: Students interview a family member who is 60+ years and ties in inherited traits including diseases that have been passed on in their family for generations.



Marine Biotechnology and Bioinformatics 2007-2008



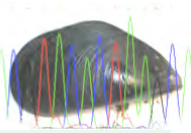
Codon Bracelet & Open Reading Frames



Instructional Strategies

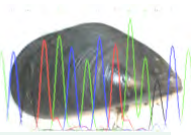
Application

- ▶ STEM Connection: Have students complete Internet search on jobs related to heredity. Include annual income, years in school, noted professionals and their contributions.



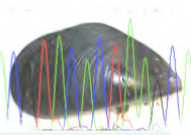
Assessment

- ▶ Completed and accurate worksheet as well as weekly assessment through quizzes and daily Journal questions.
- ▶ Extension: Make a complement bracelet with a partner in class.



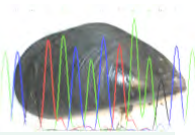
Learning Outcomes

- ▶ What are the results of the assessments of this lesson?
- ▶ What is the anecdotal evidence of learning outcomes (stories, quotes, incidents that indicate learning happened outside the assessment)

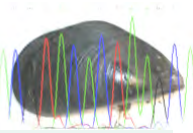


Lessons Learned

- ▶ The lesson called for 12 beads but I made it work with 4
- ▶ Hands-on activities coupled with computer time work well
- ▶ Students typed in their codon in the search field :[



Ms. Perkins did a great job!



Contact

- ▶ For more information about this lesson, contact:
 - ▶▶ Pennie A. Perkins
 - ▶▶ Science Specialist (4th, 5th, & 6th)
 - ▶▶ Curtner Elementary, Milpitas, CA
 - ▶▶ pperkins@musd.org