



MARINE BIOTECHNOLOGY & BIOINFORMATICS FOR TEACHERS
MOSS LANDING MARINE LABS NSF ITEST GRANT
TEACHER LESSON PLAN FOR CLASSROOM USE
PROTEIN SEQUENCING

Title of Lesson: Comparison of Protein sequences from two samples of crabmeat using gel electrophoresis as an introduction to the biotechnology lab

Designed by

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Background

Crabmeat is often substituted with other seafood in the market and this lab will show how Protein Sequencing of two different species will help us identify the real crabmeat. It will also be the introduction to the biotechnology lab for these students and will incorporate, the lab skills of Pipetting and gel electrophoresis. It will build the lab skills necessary for more advanced biotechnology labs involving adaptation of species in the marine environment as a thematic unit on biodiversity along the Southern California Coast.

Description of Audience: This biotechnology/bioinformatics activity is designed for use by 9th-12th grade students in a marine biology specialty. They have a great deal of field work experience sampling and surveying intertidal organisms, but very little biotechnology experience in the lab.

State Standards: This biotechnology/bioinformatics activity fulfills the following State of California Science Standards:

- *** List standard(s) here ***
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National Standards: This biotechnology/bioinformatics activity fulfills the following National Science Standards:

- *** List standard(s) here ***
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STEM Connection. Marine biologist, marine biology technician, aquarist,

Goals(s):

The goal of this lesson is to:

- ***Goal 1: Students will learn that proteins which are the product of DNA translation are different for different species and by analyzing their mass and charge we can differentiate between two different species.
- ***Goal 2: Students will learn to use some of the equipment used in the biotechnology lab to include the pipette and gel electrophoresis to separate two different proteins.

Learning Objective(s)

Upon completion of this lesson, students will be able to (Include process skills but be specific. What will the STUDENTS be able to do/demonstrate as a result of this lesson?):

- *** Objective 1 ***

- *** Objective 2 ***

Purpose/Rationale

***Why am I teaching this lesson this way?

What is the significance, relevance, reason for teaching & learning this lesson?

What are the standards that are addressed in this lesson?***

Materials/Resources

Will order a Qiagen protein electrophoresis kit.

Prior Teacher Preparation

What did you have to do to get ready for this lesson? (research, purchases, organization)

3-Step Procedure

#1 Introduction

- Make connections between prior knowledge and experiences with what is presented.
- Find out what students ideas are on this topic - uncover misconceptions!
- Review what was learned in prior lessons - then introduce content and vocabulary necessary for today's lesson.
- Use teaching charts, video clips, books, presentation software, instructional software, articles, tapes, overhead projector, handouts, models, etc. to accent instruction.
- Create and describe the structure for group learning (if applicable), whole class discussion, and individual work (journal, worksheet).

#2 Exploration

- Describe in detail the activity or investigation students will pursue with clear directions.
- Describe the path of inquiry or process of discovery to be followed - What questions will you ask? - LIST THEM!
- Prepare a lab sheet for students to record data, answer questions. This can be done in science journals.
- Students Predict / Explain. Then Explore and Discuss. Finally they Revise their explanations and theories.
- Conclude, share results, discuss, ask and answer questions, evaluate lesson, assess student understanding.

#3 Application

- How can the student apply what was learned today in his/her experience?
- How can the value of this lesson be made relevant in their lives?
- How can interest be extended?
- What is a good follow-up activity to reinforce concepts learned today?
- Provide relevant homework, class work, parent-involvement activity, research assignment...
- Career Connection. At this point write a paragraph describing careers in bioinformatics and biotechnology related to this activity. Describe how this activity contributes to students' understanding of science careers. You may also choose to list specific careers related to this activity.

Assessment

- How do you know if they GOT IT?

- Design a worksheet, journal recording, test, quiz, or performance-based activity for students to demonstrate what they have learned.
- Have your Goals and Learning Objectives been met?
- How will you do to assist those who do not "get it"? Provide an alternative activity for a student with a special need.
- How might you extend the lesson, dig deeper, go beyond?

Please include several copies of students' work, ideas, journals, and completed lab sheets. Include copies of any text pages you used as well as any handouts, lab sheets, and workbook pages.

Teachers' Self Evaluation

Reflect on strengths and weaknesses of the lesson as taught.

- Describe individual student responses to techniques used. How did they react?
- Discuss student "thinking" and ideas.
- Include samples of students answers on lab sheet or journal entry (photocopy is fine).
- Ask students for a brief evaluation of lesson. Include their responses.
- Discuss fulfilled and unfulfilled expectations. Any surprises?
- In retrospect, how would you modify this lesson?