



Investigating Invertebrates via a "Digital Notebook"

Designed by

Marianne Lancaster [marinebio39@yahoo.com}

Background

Description of Audience:

This activity is designed for use in a high school Marine Biology class. The subject matter may also be modified for use in a general biology or any advanced high school biology class.

State Standards:

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

Biology: Grades 9-12: 1a, 1c, 6a, 6e, 7a, 7d, 8a, 8b, 8d

Investigation and Experimentation: Grades 9-12: 1a, 1l, 1m

National Science Standards:

This biotechnology/bioinformatics activity fulfills the following National Science Standards:

Content Standard A: Science as Inquiry

Content Standard C: Life Science

Content Standard E: Science and Technology

STEM Connection:

Presenting scientific data via digital presentations has become a necessity in the professional and the academic world. Students must leave high school with the confidence of going beyond "pen and paper" technology so that information can be shared with their peers and superiors in an efficient and creative manner.

Technology Integration:

Students will become proficient in using "PowerPoint" not only as a presentation tool, but as a personal study tool as many students are highly visual in their learning. Notebooks like this with visuals that are student-selected promote good study habits in today's students many of whom would be less likely to study their "3-ring binders." Students will also gain proficiency in utilizing online sources for photos and data and must learn to evaluate the different websites they visit for scientific accuracy.

Goals

The goals of this lesson are to:

- Expose students to marine biology sites on the web
- Assist students in learning PowerPoint skills
- Reinforce study skills to be successful beyond high school
- Gain knowledge of the biodiversity of marine invertebrate species
- Gain an understanding of the evolutionary relationships between organisms of different phyla

Learning Objectives

Upon completion of this lesson, students will be able to:

- Access professional sites on the web for data collection and research
- Complete a professional quality PowerPoint study tool
- Share their “digital notebook” with peers in study groups
- Display their knowledge of the biodiversity of marine invertebrate species
- Exhibit an understanding of the evolutionary tree of life, especially as it pertains to marine invertebrates

Purpose/Rationale

The purpose of having students complete a digital notebook is twofold. The students will have an opportunity to have a unique notebook for study purposes and they will also be more proficient in accessing online resources and creating presentation-worthy material. The outcome will be to have an understanding of the evolutionary “tree of life” as it pertains to organisms on Earth, in this case, the primary phyla of invertebrate animals.

Materials/Resources

In order to complete this lesson, the following materials are needed:

- Student access to computers with internet (ideally, 1 computer per student)
- Student access to a web-based e-mail account such as yahoo or g-mail in order to forward copies of their notebooks to themselves and to me. This will also be necessary for me to forward to them information to be included in their notebooks.
- Flash drive to back up data. Most students have these but I have several available for those who do not have one.
- Textbook: Marine Biology by Castro and Huber (chapter 6 contains invertebrate info)

Teacher Preparation

Secure access to a computer lab for class. Prepare a group e-mail list with students’ e-mail addresses. Have several flash drives available for students who do not have their own available. Prepare list of what is to be included in notebook including minimum # of pictures required for each phylum. Prepare grading rubric for students’ notebooks.

3-Step Procedure

#1 Introduction

- Students were shown a PowerPoint slide show on invertebrate phyla.

- They also had a reading assignment in their texts (Marine Biology by Castro and Huber) which includes an introduction to these phyla.
- A field trip to Humboldt State University's Marine Lab also occurred where students had a chance to handle and explore many of these creatures.

#2 Exploration

- Lab activities included collection and microscopic investigations of local sponges
- Regeneration experiments on flatworms (Planaria) were performed
- Behavioral observations of living Hydra were made
- Dissections of annelids, sea stars, crayfish, octopuses, and clams were completed
- Phylogenetic trees were observed and studied to see genetic and evolutionary relationships between the phyla
- Web quests were completed in the computer lab to become familiar with sites pertaining to marine biology
- PowerPoint presentations were prepared by groups of students on particular phyla to be shared with the class

#3 Application

- Students were given a list of 8 invertebrate phyla along with a list of important things to know about them. These phyla were covered in their textbooks and in classroom presentations and labs. Students were instructed to complete a "digital notebook" for these including many pictures of various species from these phyla. 5 periods of 55 minutes were spent in the computer lab with their instructor to assist them in getting started and seeing them through to completion although much of the work was also done on the students' own time as homework. I am including copies of some of their notebooks as evidence of the activity.

Assessment

- Students scored almost 20% higher on invertebrate test than students in previous 3 years.
- Notebooks were all submitted to me via flash drive or e-mail and a rubric was devised for assessment of these.
- These skills will be useful in communicating with associates in any field of science. Comparing and contrasting images and data they had found made for some interesting discussions!

Teachers' Self Evaluation

Student comments were overwhelmingly positive. Comments such as "I like this much better than a notebook in a binder to study" or "I learned so much doing it this way! I had fun looking at the photos I found as I was studying!"

I am using this approach in a lesson next quarter on marine vertebrates. We will be comparing and contrasting adaptations of marine iguanas and land iguanas. This time I will include some DNA evidence that marine iguanas in the Galapagos Islands evolved from land iguana ancestors.

Also, we will be discussing how the ancestors of whales were terrestrial mammals. I will have them create phylogenetic trees showing what land mammal is most closely related to modern day whales using DNA evidence available on the web.