



BIOTECHNOLOGY/ BIOINFORMATICS ACTIVITY

Title of Lesson: Biotechnology/Bioinformatics Activity

Designed by:

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Background:

Students often can give lip service to Biotechnology or they can learn about Genetics for the standards without understand the thinking process that led to and is used in solving Genetics/population related problems and/or 2) understanding problem solving applications of genetics and Bioinformatics.

Description of Audience:

This biotechnology/bioinformatics activity is designed for use by Life Science teachers and students and those in more advanced classes wishing to set the stage for more advanced learning.

State Standards:

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

- 1 d
- 4b, 4e

National Standards:

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

- *** List standard(s) here ***

STEM Connection:

Content C – Students should demonstrate and understand the genetic principles of Heredity.

Goals(s):

The goal of this lesson is to

- understand that each species has a unique Genetic fingerprint (this should also act as a precursor for understanding the molecular clock/evolution
- That people can use “Genetic fingerprints” to solve a number of problems. Students shall understand and discuss examples of uses of DNA testing.

Learning Objective(s):

Upon completion of this lesson, students will be able to

- Categorize genetic sequences in terms of degree of relationship; who is more closely related?
- Identify 4 general uses of Genetic fingerprinting with specific examples for each.

Purpose/Rationale:

I teach a lot of students in Life Science who are not native English speakers or who otherwise have lower language and or academic skills. Many of these students are also more Kinaesthetic or alternative learning styles and need specific tasks to understand concepts. I also find that a) too much science instruction is merely telling students things without them understanding WHY or HOW and learning science as a problem solving approach; b) evolution is widely misunderstood as something that has to happen and happens for the better rather than a process with an element of chance.

Materials/Resources:

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

Colored pens/pencils/markers optional but helpful
Computers with internet access in class or use of a computer lab helpful, if not teacher would need to a) present internet search through a projector to students b) print out reading to students and possibly have students jigsaw to learn a greater variety of uses of Genetic Fingerprinting.

Prior Teacher Preparation:

Cell Organelles, Cell Division and general presentation of DNA, some basic awareness of use of genetics in family trees and animal breeding is helpful although complete familiarity with Punnett Squares, Mendelian Genetics is not necessary.

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).
- 1) *I will first make connections to students' prior knowledge of language both there being different languages, within a language there being different ways of saying things and subtly reinforce science as problem solving.*
 - 2) *Students shall be asked about their knowledge of genetics for a) diseases that run in the family (they do tend to be a bit curious about this and diabetes for example is a developing crisis that also statistically is greater in certain ethnic human populations. b) animal breeding c) plant breeding*

#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.

1) Students will receive the following problems/task:

For the following sentences a) Which two sentences are the same language?
 b) which two pairs of languages are most alike or closely related?
 (Languages are not spaced so that like genetics it takes some insight to decipher groupings like Codons)

Iamgoingshopping
 Yovoyalmercado
 Jevaisaumagasin
 Igotothestore
 Ichgehenachdieverkaufen

Group the following genetic sequences in terms of those most closely related:

AGATTCACA
 ATTACGGG
 AGATACACA
 CTTACGGGCT

(sequences are purposely slightly different in terms of language since this also occurs in analyzing codons and sequences)

Students then will be asked who cares about differences of Genetics of People or Animals?

Students are then to show look up each of the following Genetic Fingerprinting topics and for each write down at least 3 examples:

- 1) Genetic Fingerprinting for Solving Crime
- 2) Genetic Fingerprinting for Human Genealogy/Heredity
- 3) DNA testing to track endangered species:
 - a) DNA testing and Elephants
 - b) DNA testing and Whales
- 4) DNA testing for DOGS.
- 5) DNA for Vaccines
 - a) Bird Flu DNA testing
 - b) HIV flu DNA testing

#3 Application:

- *Incomplete*

Assessment:

- *Incomplete*

Teachers' Self Evaluation:

- *Incomplete*