

**Title: Biotechnology Professional Development for Secondary and Middle School Educators**

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**Abstract:** As Biotechnology in research and industry continues to increase it will be essential to increase the availability of appropriately trained educators to present the constantly evolving biotechnology practices. By providing professional development to a set of Biology educators and helping them implement biotechnology resources into their classroom, we will be able to ensure the ability to attract and motivate students into the field of biotechnology.

**Mission:** The mission of my task is to promote interest in biotechnology among secondary students by providing quality professional development to educators through exposure to hands on biotechnology labs, activities, and lesson plans.

**Description:** Biotechnology Professional Development for Science Educators is a three day training that will provide teachers the necessary background and resources to implement Biotechnology into their classrooms. Attachments to this document will include lesson plans for each day with Florida Science and Math Standards. Day one is a preliminary work up on DNA, Gel **Electrophoresis**, and Polymerase Chain Reaction (PCR). These activities are all components of Mission Biotech an interactive game being presented on day two. On the last day educators will travel to UF's CERBH Laboratory to experience Biotechnology and Industry.

**Plan of Action:**

**I. Background:**

Biotechnology is the up and coming field. By creating biotechnology supportive classrooms we ultimately create one of the keys to help ensure the future success of biotechnology for generations to come. When students are taught with hands on instructional materials they learn to apply higher level thinking skills to the process of learning science. This benefit will extend itself to other subjects such as math, reading, writing, and language development.

**II. Implementation**

These Lab activities and introduction to Mission Biotech are designed to introduce educators in Pinellas County to the new techniques being applied to old ideas like DNA, and RNA. The anchor activity is designed to be an introduction to using a pipette. This will provide the learner with the required background to move forward and be able to practice advanced

laboratory skills and apply previously acquired knowledge for a successful outcome in the following labs removing DNA from a Strawberry and Outbreak. These opening activities are also imbedded in Mission Biotech; an interactive game for students to strengthen their laboratory skills and introduce them to the variety of careers available in the field of Biotechnology. This will all be finalized on the third day where educators will enjoy a day learning about Biotechnology and Industry; the various roles supported within Industry in regards to Biotechnology.

### **III. Expected Outcomes**

After completing these activities teachers are expected to be capable of demonstrating competence in the following concepts and skills:

- A. Describe why scientists would need to extract DNA from cells of living things.
- B. Predict how the materials and steps of the experiment will help extract DNA.
- C. Perform the DNA extraction following the correct procedure.
- D. Identify what DNA looks like to the naked eye.
- E. Generate questions about DNA and the experiment.
- F. Summarize the experiment.
- G. Understand safety protocols based upon OSHA, FDA and EPA standards.
- H. Create lesson plans that lists the type of biotechnology to be used as instructional and/or assessment tools.
- I. Implement classroom activities, lessons, and PowerPoint's using mission biotech interactive biotechnology game.
- J. Design Laboratories using current Biotechnology such as Electrophoresis.
- K. Describe which division of a company is responsible for safety standards and how they must be in compliance to meet OSHA and EPA standards.
- L. Compare structural differences between DNA or RNA viruses.
- M. Summarize why viruses are not considered "living" organisms.
- N. Describe the role of vaccines in controlling the spread of viruses.

- O. Determine the appropriate equipment for a given task.
- P. Define polymerase chain reaction.
- Q. Illustrate the amplification process.
- R. Identify the threshold of a real-time PCR reaction.
- S. Describe how real-time PCR can give quantitative results of a DNA in a sample.

**Literature:** Mission Biotech Teachers Guide; Michelle Klosterman and Troy Sadler 2010

DNA Extraction: Kiwi and Strawberries Teacher Manual created by University of Florida Center for Precollegiate Education and Training.

Outbreak! Fingerprinting Virus DNA Teachers Manual; Carolina Biological Supply Company; University of Florida Center for Precollegiate Education and Training.

**Budget and Budget Justification:** The following list summarizes the supplies needed for the activities including the approximate costs and sources of supply.

Pipetting Activity locker loan

- 8 P-20 pipets
- 9 P-200 pipets
- 1 P-1000 pipet
- 96-well plates
- conical tubes
- instruction cards

Strawberry DNA extraction kit

For groups of 4 students:

- 1 bag with kiwi pieces **or** 1 bag with a strawberry
- 1 large conical tube of extraction solution
- 4 test tubes
- 4 small flip-top tubes
- 1 plastic cup
- 1 funnel
- 1 piece of cheesecloth
- 1 pair of scissors
- 1 tube of ethanol (teacher should keep on ice until needed)
- 1 hook made from a paper clip (optional)
- 50 mLs of a clear hair shampoo with EDTA (Ex. Suave).
- 8g (1-2 tsp) of NaCl (table salt)
- 450 mLs water

200 mLs of 93% Ethanol or 95% Ethanol (Store in refrigerator to keep cold.)

Graduated cylinder or 25 mL pipette

Ice

Container for the ice

Test tubes with corks or caps

Outbreak! *Carolina Biological kit: 211209 DNA only (list price \$49.95)*

6 Vials Alabama Virus DNA\*

6 Vials Pennsylvania Virus DNA\*

6 Vials Missouri Virus DNA\*

2 Pairs Disposable Gloves

8 E-Gel units (rig and power supply)

8 E-Gels

2 Safe Imagers

2 Power strips

PCR Dash game (& PCR song)