Introduction to NMSI through Experimental Design
Module 1

Module 1 Description:

This is the first module of any science training series, and is presented to a mixed audience of middle school and high school teachers. It explores the resources available through National Math + Science Initiative and emphasizes the philosophies and strategies we employ. Participants will develop the concept of experimental design by performing selected activities from the biology, chemistry, physics, and middle grades courses.

Learner Outcomes:

Participants will

- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate with in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
Chemistry of Life and Cells I
Module 2

Module 2 Description:

Pre-AP Biology teachers explore introductory activities from biology topics that involve the chemistry of life. Over the course of the training sequence, these topics are revisited and explored in depth each year. This module investigates the four major classes of biomolecules along with enzyme structure and function. An introduction to cellular structure and surface area-to-volume relationships is also explored and discussed.

Learner Outcomes:

Participants will

- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate with in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content-based knowledge about biochemistry, enzymes, and surface area-to-volume ratios.
DNA, Genetics and Animals I
Module 3

Module 3 Description:

Pre-AP Biology teachers will explore introductory activities from units on DNA, Mendelian genetics and animal systems. Over the course of the training sequence, these topics will be revisited and explored in depth each year. This first group of activities will explore Mendelian inheritance principles in maize, extract DNA from plants, and use graphing calculators to simulate Mendelian inheritance patterns. An activity comparing endotherms and ectotherms will emphasize the importance of incorporating computational activities in the biology classroom.

Learner Outcomes:

Participants will

- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate in in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Analyze the attributes of Pre-AP level assessments.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content based knowledge about genetics, essays, and the nervous system.
Plants, Ecology and Evolution I
Module 4

Module 4 Description:

Pre-AP Biology teachers will explore introductory activities from units on plants, ecology and evolution. Over the course of the training sequence, these topics will be revisited and further developed. This first group of activities will compare monocots and dicots with respect to stem and stomate structure and function, simulate natural selection, and identify the photosynthetic component of plants.

Learner Outcomes:

Participants will

- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate in in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Analyze the attributes of Pre-AP level assessments.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content based knowledge about plants and evolution.
Measurement and Statistics
Module 5

Module 5 Description:

Pre-AP Biology teachers discuss and develop student skills related to measurement and statistics in the biology classroom. Lessons are explored that incorporate microscopes and graphing calculators. Data analysis and its inclusion in laboratory reports are also addressed.

Learner Outcomes:

Participants will

- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate with in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content-based knowledge about measurement, graphing calculators, sample size, and genetics.
Chemistry of Life and Cells II
Module 6

Module 6 Description:

Pre-AP Biology teachers will investigate the laws of thermodynamics and kinetics as they relate to the biology classrooms. In addition to traditional wet labs, NMSI lessons will incorporate probeware and modeling techniques as they explore enzyme catalysis and membrane structure.

Learner Outcomes:

Participants will

- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate in in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Analyze the attributes of Pre-AP level assessments.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content based knowledge about enzymes, membranes, cell division, and data collection devices.
Cellular Processes and Animal Adaptations  
Module 7

Module 7 Description:

In this second look at DNA, genetics and animals participants will explore lessons related to endotherms and ectotherms and other animal adaptations. Participants will perform an introductory gel electrophoresis and discuss the implications of DNA fingerprinting.

Learner Outcomes:

Participants will

- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate in in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Analyze the attributes of Pre-AP level assessments.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content based knowledge about adaptations, respiration, and electrophoresis.
Plants and Ecology
Module 8

Module 8 Description:

The plant lessons for this module will investigate plant transpiration and pigment chromatography. Participants will also discuss and explore the responses and interactions of organisms with their environment as well as population studies.

Learner Outcomes:

Participants will

- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate in in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Analyze the attributes of Pre-AP level assessments.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content based knowledge about transpiration, chromatography, population growth, and planaria.
Mitosis, Passive Transport and Genetics
Module 9

Module 9 Description:

Pre-AP Biology teachers will discuss and develop student skills related to mitosis and karyotypes using manipulatives. Passive transport will be explored in two labs using microscopes and graphing calculators.

Learner Outcomes:

Participants will
- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate in in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Analyze the attributes of Pre-AP level assessments.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content based knowledge about mitosis, passive transport, and genetics.
Module 10 Description:

A discussion will be conducted over common misconceptions in the Biology classroom. Participants will also investigate bacterial transformation, viral transmission, and the trp operon using modeling strategies. Participants will use microscopes to observe a Paramecium feeding process in a traditional wet lab.

Learner Outcomes:

Participants will

- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate in in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Analyze the attributes of Pre-AP level assessments.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content based knowledge about bacterial transformation, transmission of viral diseases, paramecia’s response to food and environment, and the operon model of gene expression in prokaryotes.
Plants, Ecology and Evolution III
Module 11

Module 11 Description:

In this look at plants, ecology and evolution, participants will explore lessons related to adaptations and alternation of generations in plants. Participants will demonstrate evolution in the animal kingdom with an in-depth look at the different forms of body cavities and symmetries.

Learner Outcomes:

Participants will
- Demonstrate an understanding of the LTF philosophy.
- Perform relevant labs and activities, and participate in in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Analyze the attributes of Pre-AP level assessments.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content based knowledge about the light-independent reactions of photosynthesis, the alternation of generations in plants, specific adaptations in plants, and classification of animals.
Enzymes and Body Systems
Module 12

Module 12 Description:

Pre-AP Biology teachers will explore strategies for teaching about enzymes and conduct a lab designed to illustrate enzyme-substrate specificity using technology. The body system activities include the endocrine system, respiratory system and the excretory system.

Learner Outcomes:

Participants will

- Demonstrate an understanding of the NMSI philosophy.
- Perform relevant labs and activities, and participate in in-depth discussions that illustrate and promote rigor in the science classroom.
- Analyze the objectives of the AP exam.
- Analyze the attributes of Pre-AP level assessments.
- Demonstrate an understanding of the science process skills and how they relate to classroom activities.
- Demonstrate a deeper content based knowledge about enzymes and human body systems.