

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.

Graphing Calculators and Data Collection Devices Module 2

Module 2 Description:

Pre-AP Chemistry teachers will explore the use of TI graphing calculators and data collection devices in the chemistry classroom. A step-by-step guide to using the calculator and data collection devices will be examined and practice activities will be performed.

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, significant digits, the graphing calculator, linear regression, and data collection devices

Atomic Structure Module 3

Module 3 Description:

Pre-AP Chemistry teachers will explore lessons from the NMSI Chemistry guide that develops the concepts of matter and atomic structure. The discussion portion of the day will develop student friendly methods for teaching electron configurations, orbital notation and quantum numbers. Participants will perform two simple activities that integrate algebra and graphing skills into this unit of study.

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 electrons, quantum mechanics, and nuclear decay.

Bonding and Nomenclature

Module 4

Module 4 Description:

Pre-AP Chemistry teachers will explore lessons from the Chemistry guide that focus on bonding and nomenclature topics. The discussion portion of the day will address teaching students to draw Lewis structures, determine molecular geometries, and write correct chemical formulas. Two activities will be performed that investigate the importance of intermolecular forces and the geometry of molecules.

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 bonding, chromatography, intermolecular forces, molecular geometry, and nomenclature.

Mathematics and the Periodic Table

Module 5

Module 5 Description:

Pre-AP Chemistry teachers will discuss mathematical problem solving strategies in chemistry and investigate relationships between elements on the periodic table. Both traditional wet and dry labs will be explored with the intention of solidifying student understanding of periodic trends and their role in chemical behavior. An examination of AP style questions and common student misconceptions will further develop the strategies that can be implemented to facilitate student success.

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 problem-solving and periodicity.

Intermolecular Forces and Condensed States of Matter Module 6

Module 6 Description:

Pre-AP Chemistry teachers use a variety of techniques to explore intermolecular forces and the solid and liquid states. Computer simulations, probeware, and traditional lab activities are all utilized. A discussion of common student misconceptions and strategies to overcome those obstacles is also developed. Examining Pre-AP assessments serves to assist participants in better preparing their students for the expectations of AP science.

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 intermolecular forces and states of matter

Thermodynamics

Module 7

Module 7 Description:

Pre-AP Chemistry teachers will review concepts in thermodynamics and apply them to problem solving and laboratory experiments. Investigations using probeware and traditional laboratory equipment will be explored with emphasis on developing the conceptual framework necessary for successful problem solving.

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 thermodynamics.

Assessment and Kinetics

Module 8

Module 8 Description:

Pre-AP Chemistry teachers will spend time examining specific assessment strategies that can be implemented in the Pre-AP classroom to prepare students for AP exams. Reading of actual student samples from the NMSI Chemistry End of Course exam will help participants identify student misconceptions and emphasize the finer points of assessment development. In addition to developing participants' assessment skills, instruction in chemical kinetics and a traditional clock reaction experiment will also be included.

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 kinetics.

Reactions and Equations

Module 9

Module 9 Description:

Pre-AP Chemistry teachers will discuss types of reactions and the equations that accompany them. Both traditional wet and dry labs will be explored with the intention of solidifying student understanding of chemical reactions. An examination of AP* style net ionic questions and common student misconceptions will further develop the strategies that can be implemented to facilitate student success.

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 reactions and equations.

Solutions

Module 10

Module 10 Description:

Pre-AP Chemistry teachers will use a variety of techniques to explore the properties and nature of solutions. Multiple wet labs will be performed and colorimeters and data collection devices will be used to analyze solutions. A discussion of common student misconceptions and strategies to overcome those obstacles will also be developed. Examining Pre-AP assessments will serve to assist participants in better preparing their students for the expectations of AP science.

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 solutions.

Equilibrium

Module 11

Module 11 Description:

Pre-AP Chemistry teachers will review concepts in equilibrium and apply them to problem solving and laboratory experiments. Investigations using probeware and traditional laboratory equipment will be explored with emphasis on developing the conceptual framework necessary for successful problem solving.

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 equilibrium concepts in the Pre-AP classroom.

Gases and Wrap Up

Module 12

Module 12 Description:

Pre-AP Chemistry teachers will explore lessons and activities relating to gas laws in the chemistry class. In addition, time will be spent analyzing and evaluating the components of a rigorous chemistry lesson and participants will have the opportunity to apply those components to an activity that they can take back to their 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 gases, as well as use your skills to revise a standard lesson to a Pre-AP lesson.