

Research Experiences for Teachers (RET)
Center for Pre-College Programs
New Jersey Institute of Technology

MODULE TEMPLATE

MODULE TOPIC:

Think Like a Scientist to Solve a Problem

STANDARD(S) & INDICATOR(S):

(Note: This section should include all standards listed in the lessons.)

5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.

5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.

5.3.12.A.1: Represent and explain the relationship between the structure and function of each class of complex molecules using a variety of models.

OBJECTIVE(S):

(Note: This section should include all objectives listed in the lessons.)

- Apply Scientific method to solve a problem.
- Create different types of graph representing data obtained during lab activity, and identifying correctly independent and dependent variable.
- Apply scientific principles to build and refine standards for data collection, posing controls, and presenting evidence.
- Analyze structure and function of macromolecules

LIST OF LESSONS:

Lesson 1: Scientific thinking skills

Lesson 2: Structure and Function of Macromolecules

REFERENCES:

Cameron , S., Craig, C., & Soutee, S. (2009). *Scientific method investigation*. (pp. 4-12). United States: Mark Twain Media Inc.

Doherty , J., Waldron, I., & Spindler, L. (n.d.). *Who took juan's ipod? an organic compound mystery*. Retrieved from [http://www.accessexcellence.org/AE/ATG/data/released/0535-](http://www.accessexcellence.org/AE/ATG/data/released/0535-KathyParis/index.php)

KathyParis/index.php

Hallman, R. (2009). *Preparing for the new jersey biology eoc test* . Hudson Street, New York: AMSCO School Publications, Inc.

Levine , J. S., & Miller, K. R. (2010). *Biology* . Upper Saddle River, NJ: Pearson Education Inc.

Research Experiences for Teachers (RET)
Center for Pre-College Programs
New Jersey Institute of Technology

LESSON 1.

LESSON TOPIC:

Scientific thinking skills

STANDARD(S) & INDICATOR(S):

5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.

5.1.12.A.3: Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.

5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.

5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.

5.1.12.C.1: Reflect on and revise understandings as new evidence emerges.

5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.

OBJECTIVE(S): Students will be able to:

- ✓ Explain the usage and steps of the scientific method in pair-share setting using their note-taking guide if needed.
- ✓ Apply Scientific method to solve a problem or answer a question:
 - Marshmallow challenge
 - Flashlight activity
 - Jumping jack activity
- ✓ Identify experimental and control group during an experiment.
- ✓ Compare and contrast independent and dependent variable.
- ✓ Create different types of graph representing data obtained during lab activity, and identify correctly independent and dependent variable.

CLASSROOM ACTIVITY DESCRIPTION

Learning Experience

Fill in Note-taking guide (helps organize ideas and binder).

- Marshmallow challenge
 - Work in groups
 - Apply scientific method while having fun
 - Obtain & present Results
 - interdisciplinary (engineering)

Flashlight Activity

- ✓ Work in pair-share setting

Lesson Plan Template

Research Experiences for Teachers (RET)

Center for Pre-College Programs & Newark College of Engineering

New Jersey Institute of Technology

Research Experiences for Teachers (RET)
Center for Pre-College Programs
New Jersey Institute of Technology

- ✓ Explain scientific method
- ✓ Organize ideas
- ✓ Apply scientific method (hands on activity)

Jumping Jack Activity

- ✓ Research topic
- ✓ Conduct experiment
- ✓ Create tables, graphs, and diagrams for data/results
- ✓ Analysis of results
- ✓ Create lab report
- ✓ Involve HOTS (analysis)

STUDENT ASSESSMENT OUTCOMES:

- Complete note-taking guide (daily grade)
- Complete worksheets created on application of scientific method.
- Apply scientific method to different hands on activities:
 - Marshmallow challenge
 - Flashlight activity
 - Simpsons' worksheet
 - Solving Farmer Joe's Case
 - Jumping jack activity.
- Create graphs for data obtained during lab activity.
- Write lab report, describing their findings during lab activity.
- Review activity (inner & outer circle)

Research Experiences for Teachers (RET)
Center for Pre-College Programs
New Jersey Institute of Technology

LESSON 2.

LESSON TOPIC:

Structure and Function of Macromolecules

OBJECTIVE(S): Students will be able to:

- ✓ Define in their own words: organic compounds, biomolecules, macromolecules, and monomers using a graphic organizer.
- ✓ Describe the structures and functions of each of the four groups of macromolecules
- ✓ Compare and contrast carbohydrates, proteins, and lipids.
- ✓ Analyze the correlation between food, macromolecule and energy.
- ✓ Analyze which solution is a carbohydrate, lipid, starch, and protein by using chemical indicators.
- ✓ Define in their own words: organic compounds, biomolecules, macromolecules, and monomers using a graphic organizer.
- ✓ Describe the structures and functions of each of the four groups of macromolecules
- ✓ Compare and contrast carbohydrates, proteins, and lipids.
- ✓ Analyze the correlation between food, macromolecule and energy.
- ✓ Analyze which solution is a carbohydrate, lipid, starch, and protein by using chemical indicators.

CLASSROOM ACTIVITY DESCRIPTION

- Understand macromolecule structure and function.
- Conduct biomolecule testing experiment and solve the case of Who took Juan's iPod.

Learning Experience

- Exploration phase:
 - ✓ Analyze the saying "You are what you eat"
 - ✓ Graphic organizer of a typical meal
- Explanation:
 - ✓ Note-taking guide (Macromolecules)
 - ✓ Activities/projects
- Application:
 - ✓ 4 corner activity
 - ✓ Graffiti activity
 - ✓ Lab activity (divided in 2)

PARAMETERS TO EVALUATE STUDENT WORK PRODUCTS:

- ✓ Lab report
- ✓ Superfood project/ gallery walk

**Research Experiences for Teachers (RET)
Center for Pre-College Programs
New Jersey Institute of Technology**

This material is based upon work supported by the National Science Foundation under Grant Nos. EEC-0908889

Copyright © 2012 by the Center for Pre-College Programs, of the New Jersey Institute of Technology. All Rights Reserved.

Supporting Program: Center for Pre-College Programs, at the New Jersey Institute of Technology

Contributors

Angela Ramirez (Union City High School, Union City, NJ), Primary Author
Howard Kimmel, Levelle Burr-Alexander, John Carpinelli - Center for pre-College Programs, NJIT.
Chris D'Ambrose, Dr. Ramana Susarla, Dr. Lucas Sievens Figueroa, Dr. James Scicolone,
Rajesh Dave - C-SOPS, NJIT

Lesson Plan Template
Research Experiences for Teachers (RET)
Center for Pre-College Programs & Newark College of Engineering
New Jersey Institute of Technology