

• **AUTHORIZATION TO OFFER TOPICS COURSES FOR ACADEMIC CREDIT
THROUGH EXTENDED STUDIES** •

(Note: Extended Studies sections of topic classes for which the appropriate form E-T is not on file in the Office of Academic Programs will be removed from BANNER as periodic audits of course offerings are performed.)

Note: Any proposed topic can only be offered two times before being converted to a non-topics course. Academic Programs will assign the appropriate suffix and edit the topic description provided.

1. College of: Education 2. Center/Program/Department: _____
3. Instructor _____
(If more than one instructor will be teaching the course, list full name of the "instructor of record.")
4. Topic Abbreviation and Number: EDUC E592K 5. Grading Method N (Normal)
6. Term SUMMER 7. Year 2007 8. Variable Units* 2
9. Has this topic been offered previously? ___ Yes X No If yes, indicate term(s) _____ Year _____
10. Topic Title: Chemistry Through Inquiry
11. **Topic Description:** Note: This part can be skipped if answer to part 9 is "yes." (NOTE: Please provide detailed information about the topic. Please type. You may also attach the topic description on a separate sheet if you do not have enough space.)

This course, prepared in collaboration with the American Chemical Society, helps teachers learn inquiry-based physical science activities while improving their science-content knowledge. The course is based on the National Science Education content standards for "Physical Science" and "Science as Inquiry" and is intended for teachers of Grades 3-8. Through the use of text, graphics, short videos, and off-line activities, course participants will read about, design, and practice activities they can do with their students. They will also communicate with their e-colleagues and the instructors to share ideas about the activities, science concepts, various teaching strategies, and their own teaching experiences related to the course topics. In addition, the science concepts covered include physical properties, physical change, chemical change, states of matter, density, and mixtures and solutions.

12. Does this topic have prerequisites? No
13. Does this topic have co-requisites? No
14. Does the topic require consent for enrollment? ___ Yes X No
____ Faculty ___ Credential Analyst ___ Dean ___ Program/Center/Department - Director/Chair
15. Is topic crosslisted: ___ Yes X No If yes, indicate which course _____ and obtain signature in #18.
16. What resources are needed to offer this topic (including technology)?
17. Justification for offering this topic.

Offering this course online gives practicing teachers a flexible option for continuing their education. As graduate credit, it will qualify as electives in their Master's degree. Online courses and options to the traditional coursework for Master's Degrees have found to be in high demand as reflected in a recent survey by the College of Education.

* Enter units only if this is a variable-units topic course.

18. Does this topic impact any other disciplines? Note: This number can be skipped if answer to part 9 is "yes."

_____ Yes No If yes, obtain signature(s). Any objections should be stated in writing and attached to this form.

_____ Support _____ Oppose
Discipline Signature Date

_____ Support _____ Oppose
Discipline Signature Date

19. Location (if topic not offered at main campus) Online

20. Is this course being offered on-line? Yes _____ No

21. Is this a contract topic? Yes _____ No

22. Enrollment Limit: 30

23. Requested Bldg/Room N/A
Please call Extended Studies first to reserve the room.

Please note: A separate Form E-T must be submitted for each section offered.

SIGNATURES

N/A - presigned before
1. Program/Center/Department - Director/Chair _____ Date

[Signature]
2. College Dean (or Designee) _____ Date

The academic credentials of the instructor listed above are known to the Program/Center/Department (either regular faculty, or adjunct faculty with a curriculum vitae on file in the Program/Center/Department Office). The instructor is qualified to deliver the topic as described in part 9 (or on a previous Form T or Form E-T in the case of a topic that has already been offered).

[Signature] _____ Date 06/01/07
3. Dean of Extended Studies (or Designee)

Completed form received in the Office of Extended Studies

[Signature] _____ Date 6/29/07
4. Associate Vice President for Academic Affairs - Academic Programs



James H. Kessler
904 Lanark Way
Silver Spring, Maryland, 20901
202-872-6165
j_kessler@acs.org

Work Experience:

1989-present

American Chemical Society

Develop and publish inquiry-based physical science activities for grades K-8 in print and on the web. Conduct teacher professional development workshops for teachers in grades 3-8 both in-person and online.

1988-1989

High school science teacher, Largo High School, Prince George's County Maryland.

Taught 9th grade Biology. Developed lessons and labs for freshman biology with an emphasis on life processes at the molecular level.

1986-1988

High school science teacher, Escola Graduada de Sao Paulo, Sao Paulo, Brazil.

Taught 9th grade Biology, 11th grade Physical Science, and co-taught Theory of Knowledge in the International Baccalaureate program.

1982-1986

Association of Trial Lawyers of America (ATLA), Washington, DC

Associate editor for the ATLA Law Reporter

Wrote articles reviewing case law and appellate decisions in the developing area of products liability law.

Education:

1983-1985

University of Maryland, College of Education, College Park, MD

BS Science Education, 1985

1979-1982

Boston University School of Law, Boston MA

JD, 1982

1974-1978

Columbia University, New York, NY

BA Philosophy, 1978

**Overview**

Chemistry Through Inquiry

Course description

The course focuses on the National Science Education content standards for physical science and "science as inquiry" for K-4 and 5-8. As teachers do hands-on science investigations, read science background, and participate in discussion they will enhance their own science content knowledge and develop an inquiry-based approach to science teaching.

Performance objectives

In this course, students will:

1. Develop an understanding of the National Science Education Standards for scientific inquiry and physical science for elementary and middle school students.
2. Identify and explore developmentally appropriate activities that meet the NSES goals for chemistry-related physical science.
3. Understand the elements of design of inquiry-based physical science activities and demonstrate proficiency as they analyze and conduct guided inquiry activities.
4. Develop strategies to:
 - o Motivate students to ask scientific questions they can investigate.
 - o Guide students to identify and control variables to design valid scientific investigations.
 - o Integrate abilities and understandings of scientific inquiry with physical science content.
5. Improve own understanding of fundamental chemistry concepts related to the science activities and identify appropriate level of understanding for students.
 - o Physical properties and physical change,
 - o States of matter,
 - o Density,
 - o Mixtures and solutions, and
 - o Chemical change
6. Develop a method for using science investigations as either formative or summative assessments.

Course Outline

Week 1: What is Inquiry?

This week we read about inquiry from the National Science Education Standards and learn how an activity can be used to generate student questions and investigations.

Major Idea: Inquiry content and physical science content should be integrated when teaching science.

Week One topics include:

- What Is Inquiry? NSES for Inquiry.
- Choosing Science Content. NSES for physical science.
- Is Seeing Believing? Substances have characteristic properties.
- Student Questions. Using student-generated questions to lead scientific investigations.
- Putting Ideas (and M&Ms) Together. Identifying and controlling variables to create a fair test.
- Speaking the Language. Solutes, solvents, and the process of dissolving.

- Literature Connection. Historical example of famous controlled experiment.
- Get Your Feet Wet with Chemistry Content. Characteristics of water at the molecular level.

Week 2: Physical Properties and Physical Change

This week we investigate physical properties and physical change to discover the identity of an unknown solid and an unknown liquid.

Major Idea: Helping students to identify and control variables to design a fair test. A performance assessment can be an effective way of assessing this and other abilities and understandings of scientific inquiry.

Week Two Topics Include:

- Chemistry Mystery Solvers. The characteristic properties of substances can be used to identify unknown substances.
- Seeing is Perceiving. Developing tests to identify and compare characteristic properties of solids.
- Dissolving is the Solution! Solubility is a characteristic property a substance.
- There and Back Again. In a physical change the identity of the substance itself is not changed.
- Flowing Right Along. Developing tests to identify and compare characteristic properties of four household liquids.
- Combining Liquids. The household liquids combine with water in characteristic ways.
- Assessing Progress. Inquiry activities as performance assessments.
- Mixin' It Up with Solutions. Physical properties, physical change, and solubility.

Week 3: States of Matter

This week we investigate the different states of water and explore how changes in temperature can affect them.

Major Idea: Developing strategies to help students design tests to investigate the effect of changes of state. Changes in state are a result of transfer of energy.

Week Three Topics Include:

- Expanding Possibilities. Gases expand when they are warmed.
- A Gas Bubble-o-meter. Gases contract when they are cooled.
- Evaporation and Condensation. Adding heat increases the rate of evaporation.
- Concentrate on Condensation. Removing heat increases the rate of condensation.
- A Moisture Mystery. Water vapor in the air condenses when it is cooled.
- Catch Your Breath. Real-life applications of condensed water vapor.
- Frosty the Snowman. Water vapor condenses to a liquid and then freezes to ice.
- State Your Case. Heat transfer and changes of state.

Week 4: Density

This week we explore the concept of density through the context of sink and float.

Major Idea: Developing a meaning of density by comparing the weight of equal volumes of different substances. Changes in mass and volume affect density.

Week Four Topics Include:

- Floating the Concept of Density. Weight and volume determine density.
- Predicting Floaters and Sinkers. Comparing the weight of equal volumes of substances.
- Liquid Layers. Liquids have different densities and may sink or float in water.
- Temperature Tower. Hot water is less dense than cold water.

- **Changing a Liquid's Density.** An object may sink in fresh water yet float in saltwater because saltwater is more dense.
- **Whatever Floats Your Boat.** Increasing the volume of an object will decrease its density.
- **Density is Uncanny.** Life preservers work by adding volume without much mass.
- **Content Background.** Density is a combination of the mass of the particles and how tightly they are packed.

Week 5: Combining Substances

This week we discover that solids, liquids, and gases can all form solutions. We also use the evidence of chemical change to identify an unknown.

Major Ideas: Developing an understanding of the definition of solution and creating a chemical testing strategy to identify an unknown substance.

Week Five Topics Include:

- **Just the Right Mix.** Solids and liquids may or may not dissolve in water.
- **Deconstructing the M&M.** Substances break down to different extents in different solvents.
- **Gases Dissolve, Too!** Dissolved carbon dioxide gas can be removed from carbonated water.
- **The Lemon Soda Challenge.** Use understanding of dissolved gases to solve the problem of maintaining carbonation in a lemon soda.
- **Colorful Cabbage.** Substances react chemically in characteristic ways.
- **Mystery Powder Line-Up.** Characteristic results of chemical tests are used to identify an unknown.
- **More Evidence of Chemical Change.** Temperature change and formation of a precipitate can also be evidence of chemical change.
- **Reviewing Mixtures, Solutions, and Chemical Changes.** A chemical reaction involves the breaking and making of bonds.

Culminating Project

Students describe an investigation they have conducted or observed that develops a physical science principle. They then explain how the lesson incorporates or could be modified to incorporate the 5 essential features of inquiry.

OK