Recent Advances in Chemistry: Course Outline

NEW YORK UNIVERSITY

THE STEINHARDT SCHOOL OF CULTURE, EDUCATION, AND HUMAN DEVELOPMENT

Department of Teaching and Learning

Science Education Program

637 East Building

239 Greene Street

E14.2016

Recent Advances in Chemistry

Instructor: Jason Blonstein

Fall 2010

Instructor:

Class will meet Tuesdays until further notice in room 412 Silver building.

Jason Blonstein

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Office Hours: M-TH 2:30-4:30PM

Please call or email for appointment

Class Time: Thursday
4:55-6:35 PM

Course Outline

Using the phenomena of chemical reactions, atomic, and kinetic theory this course aims to emphasize the dynamics of chemical explanations and to introduce you to strategies for teaching chemistry- and more generally, science. Too often the chemistry that students are expected to learn is completely disconnected from their experiences. In this course we want you to think about the role of questions, levels of representation and modeling using multimedia simulations. A goal of this course is that each participant will have an opportunity to study a topic that is a part of "everyday life" and at the forefront of current or relatively current scientific research and be able to connect this topic with content in the New York State Chemistry Core Curriculum.

Requirements

1. Demonstrate an understanding of important concepts in chemistry that help to explain why it is sometimes called the "central science" by completing a number of activities in major areas of chemistry.

2. Conduct research to explain the chemistry of everyday items:

    a. An outline indicating how you intend to develop your argument the topic with an emphasis on the questions that informed your research and how you answered these questions.

    b. Initial paper. A 1500-3000 word scholarly paper in which you clearly, accurately and entertainingly explain the chemistry behind the topic. The paper should be written at a level appropriate for teachers and parents.

c. Final paper and corresponding power point presentation.

3. Develop an inquiry-based activity associated with your chosen topic or simulations.

4. Attend one of the Saturday Science series.

Course Content

What is chemistry? What does it mean to "know" chemistry? How does knowledge of recent advances in chemistry aid the teacher and learner?

What are the main theories that support our understanding of chemistry? What is the role of kinetic molecular theory and atomic theory?

What are chemical reactions? What is needed for a chemical reaction to take place?

How can we understand why a chemical reaction does or does not take place?

What do we need to know to provide a safe working environment for science, especially chemistry?

Topics

For task 2 you will be able to select from the list of topics or you can suggest your own topic for investigation but has to be approved by the instructor. Each participant will be required to choose a topic for study and the topics will be allocated on a first come first served basis.

Possible topics include:

How do LCDs work?

What is the chemistry behind the Neverflat basketball?

How is phase change important to Bluray disks?

What are zeolites and why are they important?

How does no-tears shampoo work?

What are co-enzymes do they really benefit human health?

How are paints polymers?

How do Post-it notes work?

What is candy triboluminescence and how can it be explained?

How do light sticks work?

How does white out work?

How does washing soda soften hard water and is that all it does?

How does Viagra work?

What is alpha hydroxy acid in anti-aging creams and does it work?

Why should ammonia cleaners never be mixed with bleach?

What is smart glass and how does it work?

What is green chemistry?

What are some of the recent advances in chemistry?

As part of the course you will select from a series of areas of contemporary chemistry including:

- Green Chemistry including bioplastics
- Zeolite chemistry

- Super adsorbent polymers
- Space chemistry
- Green Preservatives
- Combinatorial Chemistry
    - Alloys
    - Cements/Concrete
    - Electrically Conductive Polymers
    - Developments in LED technology
    - Adhesives

Attendance and Participation

This course is based on the idea of collaborative and participatory learning, which means that your presence in the class is necessary to provide the richest possible learning environment for all participants in the class. Failure to attend classes will compromise your grade. For every absence you will forfeit 10% of your grade. Tardiness also will be taken into consideration.

Citations and Referencing

In this course it is expected that you will cite all sources of information that you use and that you will include in a bibliography if necessary. Use APA referencing and citations.

Grading

Grading for this course will be based on:

1. Your ability to complete the requirements outlined.

2. Attendance and participation in class discussions.

3. A self evaluation based upon gathered evidence.

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Fall 2010
Silver 412, 4:55 - 6:30 PM

Agenda

1.Calendar of Classes
9/16 Syllabus review and reintroduction to chemistry
Assignment: Nakhieh, Chemical Misconceptions: Johnstone, Levels of representation
9/23 Considering diagnosis and treatment of misconceptions; why consider all three levels of representation?
Assignment: Atkins,The Future of Matter; Atkins, The periodic kingdom
9/30 Thinking about atoms: what do we mean by discrete?
Assignment: Paper proposals due. Feynman: Plenty of room at the bottom; Nanoworld
10/7 Thinking very small, from nanobots to stain resistance.
Assignment: The Noise of Heat
10/14 Chemicals and chemical change as information: thermodynamics.
Assignment: Green chemistry; Principles of Green Chemistry
10/21 Making bioplastics
Assignment: Outline of research paper due: "A life of its own"
10/28 Biofuels ; Presentations by selected students on research papers
Assignment: Sunscreen activity
11/4 Associated activities to research paper
Assignment: Read one student paper; one article from "Best Science Writing" series from list in Course Docs.

11/11Recent Advances in Materials Science: concrete jewelry?
Assignment:Have first drafts of papers ready for sharing: Read Cold Fire by Sacks

11/18 First drafts due for speed dating (sharing papers); activity preparation
Assignment: Revise papers, complete bibliography Read N and Hydrogen by Levi

12/2 Presentations of activities related to research papers. Using a presentation rubric.

12/9 Presentations of activities related to research papers. Using a presentation rubric.

2. Reading response: Misconceptions and conceptions

3. Reconsidering neutralization

Assignment listed above