

SCID 212

Science for Educators III - Our Physical World

Course Information

- A. SCID 212, 4 credits
- B. Science for Educators III: Our Physical World
- C. Prerequisite: SCID 211
- D. Availability: Spring Quarter
- E. Course Location: Education Building in room 113
- F. Time: Tues. and Thurs. 10:00 - 11:50 p.m.

Instructor Information

- A. Instructor: Charles Bertsch
- B. Office Hours: by appointment
- C. Cell Phone: 406-253-2998
- D. Email: charles_bertsch@skc.edu

SCIS 212

Science for Educators III - Our Physical World is a general overview of physical sciences and chemistry for education majors. Topics explored will include properties of matter, mechanics of force, electricity, magnetism, light and optics, sound and the foundations of chemistry. This course includes numerous hands-on embedded lab activities, many of which involve cultural themes or frameworks.

Course Description

This class will focus on topics related to chemistry and physics. The scope of the science topics will reflect content appropriate for use by teachers of students in the elementary grades. Extensive guided inquiry, hands-on, cooperative learning and mini-lectures will be the norm for this class. Science safety in the classroom will be discussed and enforced for all activities.

Required Materials

Hewitt, Paul; Suchocki, John; Hewitt, Leslie (2003). *Conceptual Physical Science Explorations*, first edition or 5th edition. Addison Wesley ISBN 0-321-10663-6 (case)

Attendance

Attendance is mandatory due to the nature of this course. As an adult learner in this class, you are a co-creator in the content of this course. To bring meaning to the course content you will be asked to participate in discussion, group work, presentations and other class activities. A variety of class activities, discussions and presentations will be conducted throughout the course. These cannot be made up, therefore your absence forfeits the opportunity to learn from the activities. Additionally, your absence represents a limitation in the ability of others to learn from you.

Students are expected to be on time for class and to stay until the designated time set for dismissal. If a student must leave early she/he must inform the instructor at the beginning of class. Communication with the instructor is very important in this class; if students know that they will have to miss a class, they must contact the instructor ahead of time. Students missing more than 3 class meetings (6 hours) may need to drop the course. Late arrivals (after the instructor begins class) will result in a reduction of attendance points. No points will be given if candidates miss 40 min. or more of any class meeting.

Cell Phones

Cell phone use is a distraction to the instructor and other students. By SKC policy, students must keep cell phones off during class.

In-completes

In-completes will not be given except in the case of serious emergencies such as a death in the family or extreme medical illness. In-completes will not be used in cases where students have not completed assignments and are requesting more time to finish the course requirements. In the event of medical or other emergencies where in-completes are necessary, arrangements including a signed contract for completed work and its timeline will be made with instructor prior to the end of the quarter.

Academic Honesty

The instructor will exercise his/her right to issue failing grades to students who engage in academic dishonesty, including **plagiarism**. Refer to the SKC Student Handbook for more information on policies regarding academic honesty.

Accommodation

Any student who feels she/he may need an accommodation based on the impact of a disability should contact the instructor privately to discuss your specific needs; this should be done in the first week of class. Reasonable accommodations are provided for eligible students with identified disabilities. The College complies with Section 504 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act. Students may contact the Disability Services Coordinator, Linda Pete, at 275-4968, linda_pete@skc.edu, or consult the SKC web page for Students with Disabilities for more information.

Tutors

Tutors are available for students! Please contact the instructor or the Career Center/Counseling staff if you have any questions or need a tutor. I am also available if you need extra help.

Instructional Methodologies

The instructor will utilize a variety of instructional strategies including, but not limited to, discovery learning, cooperative learning, group projects, presentations and discussions, case study analysis, web-related learning, Smart-boards, guest speakers and other resources.

Course Objectives

A) General Course Objectives: This is what students should be able to do at the end of the session.
Describe the periodic law and atomic structure using topics that include elements and compounds and chemical bonds.

Be familiar with how crystals, ions and solutions, quantitative chemistry, chemical energy, fuels and reaction rates affect the world on which we live.

Describe motion using the concepts of acceleration, distance/time, gravity and the laws of motion.

Describe energy with topics of force, work, energy and momentum.

Describe wave motion, sound waves, electromagnetic waves and wave behavior.

Understand some basic concepts related to electricity and magnetism.

Understand the relationships between electricity and magnetism.

B) Critical Thinking Objectives:

Apply physical concepts to everyday situations.

Interpret and articulate physical and chemical connections between specific ecological systems. Compare and analyze various interactions between the scientific and cultural domains, especially as they relate to K-8 level science content.

C) Cultural Objectives

Explore and describe connections between scientific principles and traditional Native American cultural background(s).

Identify ways in which Native American students' world views differ from other cultures relating to the physical sciences.

Course Requirements

A) Class Participation /Attendance: class participation/attendance is very important in this class, as concepts will build on each other and missed in-class activities and discussions cannot be made up. If a student knows that they will have to miss a class, then they must contact the instructor ahead of time and make arrangements. Communication is important, be honest and let me know by email or with a phone call. Don't wait until the next class, by then it will be too late to make up the missing material. More than 3-missed classes (without approved make-up work) will result in the student being dropped from the class. Students are expected to be on time for class and stay until the designated time for dismissal. (40% of the final grade)

B) Readings and Chapter Questions: read assigned chapters and complete the vocabulary and answer assigned question at the end of each chapter. (20% of final grade)

C) Lab Observation Log: A hard copy log/journal will be kept on all labs/activities/summaries done in or out of class. (20% of the final grade)

D) Final Test: there will be a comprehensive test on the last day of class. Those students who have not been late to class, absent, and have turned in all of their work on time will be given a 20 extra points on the test. (20% of the final grade)

E) Extra Credit: The contents of this project should present how aspects of physics and/or chemistry are used in the early American Indian/Alaskan Native cultures. Turned in the 9th week of the quarter. Choice of doing: research paper, science fair project, science demonstration, or/and teaching lesson plan in physics or chemistry. (10% added to grade)

Grading: 100 - 90% = A 79 - 70% = C
 89 - 80% = B 69 - 60 % = D below 60 % = F

Course Outline

Week 1: Magnetism - magnetic poles, attraction and repulsion, magnetic fields, magnetic domains, interactions between electric currents and magnetic fields, coils, electromagnets, the relationship between magnetism and electricity.

Week 2: Electricity - electric charge in a basic characteristic of matter, the force between charged particles, the flow of electric charge, an electric current if produced by electrical pressure, electrical resistance, the relationship between current, voltage and resistance, direct current and alternating current and parallel and series circuits.

Week 3: Waves and Sound - vibrations and waves, wave motion, transverse and longitudinal waves, reflection and refraction of sound waves, forced vibrations and natural frequency, interference, the

doppler effect and shock waves and the sonic boom.

Week 4: Light - electromagnetic spectrum, why materials are either transparent or opaque, color science, mixing colored light, mixing colored pigments, reflection of light, refraction of light, diffraction of light and dispersion of light.

Week 5: Atoms and the Periodic Table - elements, atoms, protons and neutrons in the nucleus, learning about the periodic table, atomic models and Niels Bohr and the quantum hypothesis.

Week 6: Chemistry - submicroscopic world, states of matter, physical and chemical properties, elements, compounds, molecules, chemical reactions and chemical equations, matter as pure or impure, homogeneous and heterogeneous mixtures, solutions and suspensions and mole and molarity.

Week 7: Chemical Bonding - atomic bonds, valence electrons, ionic bonds, covalent bonds, polar covalent bonds, molecular polarity, and acids and bases.

Week 8: Newton's First and Second Law of Motion - motion is relative, the law of inertia, net force, equilibrium for objects at rest, support force, equilibrium for moving objects, acceleration, force causes acceleration, mass is a measure of inertia, mass resists acceleration, the second law links force, acceleration, and mass and friction is force that affects motion, free fall, and air drag.

Week 9: Newton's Third Law of Motion - force is part of an interaction, action and reaction, action and reaction on objects of different masses, action and reaction forces act on different objects, action equal reaction and summary of Newton's three laws. There is only one class this week.

Week 10: Momentum - inertia in motion, impulse changes momentum, increasing momentum (increase force, time, or both), decreasing momentum, elastic and inelastic collisions and a brief introduction to gravity.