UNIVERSITY OF TEXAS AT SAN ANTONIO
College of Education
Department of Interdisciplinary Learning and Teaching

IDS 3211
ADVANCED EARTH SYSTEMS LAB
Spring 2008

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DEPARTMENT OF INTERDISCIPLINARY LEARNING AND TEACHING
Mission: The mission of the Department of Interdisciplinary Learning and Teaching is to foster the intellectual and professional growth and integrity of students and faculty through critical reflection and dialogue, civic responsibility, and leadership.

Goals: The Department of Interdisciplinary Learning and Teaching will create a context that nurtures interdisciplinary learners who:

- Acquire and demonstrate content and discipline knowledge
- Demonstrate an awareness and acknowledgement of and engagement in research-based, reflective, culturally responsive practices
- Are producers, disseminators, and critical consumers of research
- Demonstrate an awareness and acknowledgment of and engagement in social justice and equitable practices
- Articulate their professional philosophy and demonstrate a strong professional identity

COURSE DESCRIPTION
Introduction to the tools, techniques, and topics of earth systems science investigations with academic applications. Prerequisite: Completion of math and science core curriculum.

COURSE OBJECTIVES
Students will be able to:

1. acquire skills needed to collect and interpret environmental data
2. demonstrate an understanding of the key components of earth system science: hydrosphere, geosphere, biosphere, and atmosphere.
3. contribute to a worldwide research effort in collaboration with scientists to generate knowledge about the earth as an interconnected system.

4. exhibit a holistic understanding of Planet Earth, recognizing that it is a system comprised of changing and interacting subsystems.
5. use current technologies as tools to access and process information about the Earth's systems.
6. demonstrate skills for engaging in individual and collaborative scientific and social endeavors.
7. demonstrate effective communication skills within the context of science.

COURSE RATIONALE

The purpose of this course is to help pre-service elementary teachers enrich their curriculum through authentic, inquiry-based applications of mathematics and science in an integrated earth systems science context. The course will study the interactions between the hydrosphere, atmosphere, biosphere, and geosphere that together make up the Earth System. The intent of this course is to promote an understanding of natural resources using a systems approach. This course will provide opportunities for students to start making connections between a variety of disciplines and concepts.

METHODS OF INSTRUCTION

This course will be taught with a variety of teaching methods. In-class activities will consist of short lecture, small cooperative group work, hands-on activities, and individual and group activities. Field trips and outdoor field data collection will also be conducted. As weather permits, part of every class time will be spent outdoors. Come prepared for any weather. Appropriate shoes, hats, jackets, sunglasses, sunscreen, water, and backpack will make for more enjoyable outings.

USE OF TECHNOLOGY

Technology is recognized as not only an important methodology to utilize in the classroom, but in today's classroom, a necessary tool. Therefore, various forms of technology as instructional tools will be modeled in this course. This will include, but not be limited to, video tapes, overhead projectors, WebCT, Internet resources, WebQuests, and computer software. The use of the computer will be **required** in the writing of all written work submitted for evaluation.

Communication will occur periodically individually and as a class using electronic sources. WebCT provides a rich source for communication and idea exchange. Weekly agendas, syllabus, course materials and readings, updates, and announcements are available on this site. Please visit the site ASAP to become familiar with its tools. It is **your** responsibility to monitor the site on a regular basis.

CONCEPTUAL FRAMEWORK

Earth as a System

A. Earth is Whole

"One of our civilization's major discoveries is that we live on a round planet. Today we are in the middle of a more awesome discovery about the nature of our home. Earth is not flat. Earth is not round. Earth is whole."

"Earth is Whole" means that all the planet's physical features and living organisms are interconnected. They work together in important and meaningful ways. The clouds, oceans, mountains, volcanoes, plants, bacteria and animals are all functioning parts of Earth's Operating System.

B. Systems within Systems within Systems

"We use the word "system" when we want to describe something that is made up of different kinds of parts that join together to form an interconnected whole. Learning to think in terms of systems is very useful because we are surrounded by all sorts of systems. In fact, each of us is our own little system."

C. The Earth System

*"In examining Earth as a whole, we use systems thinking to focus on **Earth's matter, Earth's energy and Earth's life**. In other words, we are going to examine from a systems point of view the stuff (matter) that exists on planet Earth, the energy that makes things happen on planet Earth, and the organisms that make our planet unique in the solar system."*
(Excerpts from Dr. Art's Guide to Planet Earth by Art Sussman)

BASIC GLOBE PROTOCOLS

Soil Science • Selecting, Exposing, and Describing a Soil Characterization Site • Soil Characterization • Soil pH
Land Cover/Biological Science • Site Selection • MUC • Land Cover Sampling • Biometry
Hydrology • Instrument Construction, Site Selection and Sampling Procedures • Water Transparency • Water Temperature • Water pH • Dissolved Oxygen • Electrical Conductivity • Freshwater Marco invertebrates
Atmospheric Science • Instrument Construction, Site Selection and Setup • Clouds • Digital Multi-Day Maximum, Minimum, and Current Temperature • Precipitation • Relative Humidity

Global Positioning Systems • Latitude • Longitude • Elevation
Earth as a System • Climate Change • Seasonal patterns • Universal Time

REQUIRED COURSE MATERIALS

1. Text Book : Guide to Planet Earth by Art Sussman, Chelsea Green Publishing Company

2.GLOBE teachers manual. The teachers manual may be downloaded from the globe website or the GLOBE CD, or you may purchase a condensed version of the manual at L&M bookstore

3.GLOBE field data manual: Each group of four will receive one copy of the lab manual. You may make individual copies of the lab manual by downloading the data sheets from the CD.

4.Binder for group field data log

5.Science SBEC Standards (I, II, III, VI, IX, and X) for EC-4 and 4-8 teacher certification. www.sbec.state.tx.us

ASSESSMENT

Assignment	Point Value	Percent of grade
Questions: Protocols and Website	5 x 3 = 15	15%
Test and Quizzes	15	15%
Teaching project	10	10%
Field data log	50	50%
Inquiry investigation	10	10%
Total	**100**	**100%**

GRADING SCALE

A = 90-100 points
B = 80-89 points
C = 70-79 points
D = 60-69 points

COURSE REQUIREMENTS

1. Questions**:** All students are expected to submit complete answers . GLOBE website and protocol questions pertaining to Soils, Land Cover, Hydrology and Atmosphere. The questions are posted on WebCT.
2. Tests and Quizzes will be taken from the Text book and Globe materials
3. Teaching Project: Students, in small groups, will organize and teach one learning activity from one protocol in the GLOBE curriculum to their peers. Guidelines for project will be posted on WebCT.
4. Field Data Log**:** Students will be organized into field data groups. Each group will maintain a field data log of protocol measurements that will be handed in at completion of all labs.
5. Inquiry investigation: Students, in field data groups, will conduct an inquiry investigation and present the results and conclusions to the class. Guidelines for the inquiry investigations will be posted on WebCT.

PROFESSIONALISM

An important part of this course is the growth students make toward becoming professional educators. Students are expected to submit work that represents their best effort. All assignments must conform to university policies governing academic dishonesty. All work submitted must be edited for grammar, spelling and correct sentence structure. Materials submitted in this class **must be typed**, double spaced, single sided (12 pt. font, 1 inch margins). The instructor reserves the right to deduct points from any assignment that does not conform to professional writing standards.

ATTENDANCE

Class attendance and promptness is mandatory. The preservice teacher is preparing for a profession where attendance, promptness, and being well prepared and organized are vital. In addition, because this is a hands-on class, many instructional strategies will be demonstrated and lecture will be kept to a minimum. Learning by borrowing someone else's lab notes will be nearly impossible. It is therefore imperative that students be present, timely, and involved in all aspects of the course. Attendance will be monitored at all class meetings.

Tardiness and absences will both affect the final grade. Due to the nature of the course, make-up labs will not be offered. Students will be allowed one excused or unexcused absence without any point deduction. For each missed lab beyond the one allowed absence, there will be a 5 point deduction from the total point value of the course, regardless if the absence is excused or unexcused. Two tardies or leaving class early will be equivalent to one absence. If students cannot make it to class, they are still responsible for the materials that they miss and the data log entry for that day. Attendance will be documented for each class period. It is the student's responsibility to sign in on the attendance sheet each class period.

Absences and inadequate preparation cannot be made up. **All assignments are due at the time of scheduled class.** Papers or projects that are late due to illness or personal emergency are accepted without deduction of points, but only when adequate

documentation and approval of instructor are provided. Papers or projects submitted more than 7 days after the due date will not be accepted, regardless if excused or unexcused absence. **Late work will be accepted at a cost of a letter grade per calendar day late**.

PARTICIPATION

An important requirement of this course is active participation. It is expected that you will be prepared for each class period. Throughout the semester you will be working in groups to complete assignments. While most of this group work will occur in the classroom, you may be required to work with your group outside of the lab time. It is your responsibility to work as an active group member. If you do not actively work with your group members, you will have points deducted from your total grade. Students will complete a final evaluation of self and each group member and these evaluations will be used to determine class participation points.

UNIVERSITY POLICIES

The University expects every student to maintain a high standard of individual integrity for work done. Scholastic dishonesty is a serious offense, which includes, but is not limited to, cheating on a test or other class work, plagiarism (the appropriation of another's work and the unauthorized incorporation of that work in one's own work), and collusion (the unauthorized collaboration with another person in preparing college work offered for credit). In cases of scholastic dishonesty, the faculty member responsible for the class may initiate disciplinary proceedings against the student. In this class all UTSA procedures will be followed and the necessary paperwork will be filed with the Office of Student life and the College of Education and Human Development. A penalty will be recommended by the course instructor to the Office of Student Life which may impose an additional university penalty.

ACCOMODATIONS FOR SPECIAL STUDENTS

If any member of this class feels that he/she has a disability and needs special accommodations of any nature whatsoever, the instructor will work with you and the Office of Disability Services to perform in this class. Students with disabilities must be registered with the Office of Disability Services located in MS 2.03.18 (Main Campus, 458-4157) or BV 1.302 (Downtown, 458-2838). Please advise the instructor of such disability and the desired accommodations at some point before or immediately after the first scheduled class period.

FLEXIBILITY CLAUSE

Flexibility is one key to learning. The instructor reserves the right to modify or change the assignments, sequence of assignments, or weight of assignments as necessary and as reflected by the needs of individuals or the group during the semester. This course outline represents a tentative listing of information and modifications may be assigned as necessary and appropriate. **If you are not in class, you may miss important information that directly affects your grade!**

Department of Interdisciplinary Learning and Teaching Mission and Goal Statements:

Mission

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GLOBE REGISTRATION

You must register online for the GLOBE program. You must register before **September 15th**. Directions for online registration are as follows:

www.globe.gov
Enter Globe Site
Click on Educator's Corner (left hand side of website)
Go to Teachers Workshops
Click on Teacher Workshop registration
Click on San Antonio TX – University of Texas at San Antonio
Click on "I would like to register" and Submit
Complete Teacher Information ONLY. DO NOT complete School Information.
Complete Teacher Home Information ONLY. DO NOT complete School Information.
Submit. You should now be registered.

SBEC SCIENCE STANDARDS
Grades EC-4 and 4-8

Standard III. **The science teacher understands the process of scientific inquiry and its role in science instruction.**

Teacher Knowledge: What Teachers Know

The beginning teacher knows and understands:

3.1k how scientists use different types of investigation, depending on the questions they are trying to answer;

3.2k principles and procedures for designing and conducting an inquiry-based scientific investigation;

3.3k the characteristics of various types of scientific investigations (e.g., descriptive studies, controlled experiments, comparative data analysis);

3.4k how current knowledge and theories guide scientific investigations;

3.5k the use of technology in scientific research; and

3.6k appropriate methods of statistical analysis and measures (e.g., mean, median, mode, correlation).

Application: What Teachers Can Do

The beginning teacher is able to:

3.1s design and conduct inquiry-based scientific investigations, including nonexperimental and experimental designs;

3.2s plan and implement instruction that provides opportunities for all students to engage in scientific inquiry by using various appropriate combinations of the following processes:

- ask a scientific question;
- formulate a testable hypothesis;
- select appropriate equipment and technology for gathering information related to the hypothesis;
- make observations and collect data taking accurate and precise measurements;
- organize, analyze, and evaluate data to find data trends and patterns and make inferences; and
- communicate and defend a valid conclusion about the hypothesis under investigation;

3.3s link inquiry investigations to students' prior knowledge and experience;

3.4s focus inquiry-based instruction on questions and issues that are relevant to students;

3.5s use strategies to assist students in identifying, refining, and focusing scientific ideas and questions guiding an inquiry activity;

3.6s guide students in making systematic observations and measurements;

3.7s use a variety of tools and techniques to access, gather, store, retrieve, organize, and analyze data;

3.8s provide opportunities for students to use higher-order thinking skills, logical reasoning, and scientific problem solving to reach conclusions based on

evidence;
3.9s develop, analyze, and evaluate different explanations for a given scientific result;
3.10s identify potential sources of error in a given inquiry-based investigation; and
3.11s develop criteria for assessing student participation in and understanding of the inquiry process.

Standard XI. **The science teacher knows unifying concepts and processes that are common to all sciences.**

Teacher Knowledge: What Teachers Know

The beginning teacher knows and understands:
11.1k how systems and subsystems can be used as a conceptual framework to organize and unify the common themes of science and technology;
11.2k how patterns in observations and data which explain natural phenomena allow predictions to be made;
11.3k how the concepts and processes listed below provide a unifying framework across the science disciplines:

- systems, order, and organization;
- evidence, models, and explanation;
- change, constancy, and measurements;
- evolution and equilibrium; and
- form and function;

11.4k properties and patterns of systems can be described in terms of space, time, energy, and matter;
11.5k how change and constancy occur in systems;
11.6k the complementary nature of form and function in a given system; and
11.7k how models are used to represent the natural world and how to evaluate the strengths and limitations of a variety of scientific models (e.g., physical, conceptual, mathematical).

Application: What Teachers Can Do

The beginning teacher is able to:
11.1s apply the systems model to identify and analyze common themes that occur in physical science, life science, and Earth and space science;
11.2s analyze a system (e.g., a cell, the ocean, an ideal gas) in terms of cycles, structure, and processes;
11.3s analyze the general features of systems (e.g., input, process, output, feedback);
11.4s analyze the interactions that occur between the components of a given system or subsystem;
11.5s analyze the interactions and interrelationships between various systems and subsystems; and
11.6s use the systems model to analyze the concepts of constancy (e.g., conservation of mass, energy, and momentum) and change (e.g., evolution).

LABORATORY SAFETY RULES

Contact with many of the chemicals we use in the laboratory may have harmful effects on the user. For some it may be enough to just inhale them. Always be careful when you are in the lab.

Personal Protective Equipment (PPE) is anything you have to wear when handling chemicals. This includes, but is not limited to:

a. Eye protection (chemical splash goggles or full face shield, depending on what you are working on) – wear these always.
b. Gloves – wear these always. When you are not working on your experiment in the lab, but wish to use a computer, a telephone, or leave the room, take off your gloves to avoid contamination.
c. Some experiments may require that a lab apron be worn.

Wear clothing that is comfortable, of natural fibers, and that will cover your body as much as possible (long sleeves, long pants). Do not wear loose clothing – a loose sleeve may catch on glassware and cause a spill. Do wear comfortable, low leather shoes. Do not come to the lab wearing tank tops, shorts, or sandals. Also remove jewelry. If you have long hair, be sure to tie it back so that it will not come into contact with the chemicals or with an open flame.

Open flames may be necessary in some of the experiments. Before lighting a flame, make sure no flammable solvents are nearby. Flammable solvents or other volatile chemicals (example: alcohols such as methanol, or ketones, such as acetone) may not be heated on a hot plate in an open vessel. Set up a condensing system instead.

In an emergency:

a. Injuries such as cuts $\rightarrow$ tell the instructor immediately; if it is a serious cut, use a clean towel and apply direct pressure to the area, then notify the instructor;
b. Fires or other imminent danger $\rightarrow$ tell the instructor and the other students immediately;
c. Chemical splash into eyes $\rightarrow$ immediately get the eye(s) washed out at the eyewash station.

Be sure to know where to find the following items and how to operate them:

a. Fire extinguisher
b. Fire blanket
c. Fire alarm box
d. Safety shower
e. Eye wash station
f. Exit doors
g. Telephones

Always wash your hands before leaving the lab.

Do not bring food or beverages into the laboratory. Neither eating, nor drinking or smoking is allowed in the laboratory.

Always wait with your work in the laboratory until you have ensured that an instructor is there to help you if problems arise.

Prepare for your lab session beforehand so that you know what is expected of you. If you have any doubts along the way, ask your instructor.

Keep the aisles and walkways clear and drawers and cabinet doors closed while you are working.

Do not ever use mouth suction to pipette chemicals and avoid inhaling or tasting chemicals.

If you have to insert glass tubing into a rubber stopper, do so with minimal force. First use a lubricant such as glycerol on the tube and the stopper, then protect your hands by wrapping the tubing in a towel before pushing the tube into the stopper.

Before touching glassware, make sure it is not hot.

Children are not allowed in the laboratory.

Preparation for Lab Sessions

Carefully read the description of any scheduled experiments before the session begins. This may require you to read additional materials. If there are any pre-lab exercises, do them to the best of your ability and bring them to the lab. Such exercises are intended to help you better understand what you are about to do and to aid you in necessary calculations and observations. Write yourself an outline of the experiment and include applicable data tables and questions you might have about the process or outcome. You may use your laboratory manual for such notes.

During the Lab Session

As you carry out the experiment(s), don't forget to keep track of your observations. Write them down in your manual. If, as you compare your observations with expected data, you find that your data is questionable, check your procedure and setup to make sure everything is prepared as it is supposed to be. It is then best to repeat the experiment to get better data. You may wish to consult your instructor first. Pay attention to your instructor and make sure you are not missing explanations on the experiment(s).

Clean up after yourself.

ALWAYS BE SAFE.