UNIVERSITY of NORTHERN COLORADO

SCED 578, *K-12 Science Inquiry* (3 credits)
On-campus/On-line Course
Summer 2009

Instructors:	Dr. Teresa Higgins	Mr. Ray Tschillard
Phone Number:	970-351-2617	970-352-1267
Email:	teresa.higgins@unco.edu	rtschillard@greeleyschools.org

Office Hours: By Appointment

Class Schedule: Jun 8-10 and Jun 24-26 on campus from 9:00am-2:00pm location TBA; Jun 11-23 online

Required Texts and Readings:

1. *Inquiry and the National Science Education Standards: A guide for teaching and learning*, Center for Science, Mathematics and Engineering Education, National Research Council, National Academy Press, 2000.
2. *How Students Learn: Science in the Classroom*, Committee on How People Learn, A Targeted Report for Teachers; S. M. Donovan and J. D. Bransford, Eds., 2005.
3. *National Science Education Standards*, Center for Science, Mathematics and Engineering Education, National Research Council, National Academy Press, 1996.
4. Selected readings and articles from research and professional publications.

Course description

This graduate course will explore and define the elements of inquiry in elementary, secondary, and post-secondary science education from the perspective of pedagogical strategies for teaching with inquiry, the ability to do inquiry, and inquiry as an aspect of science content. Current research literature, state and national science education standards, and science-reform documents will be used to inform discussions and in-class/online engagements.

Purpose of the Course

What is inquiry in the science classroom and how does it contribute to student learning? At first glance many teachers may respond by evoking aspects of the so-called "scientific method," but the *National Science Education Standards* (NSES) (National Research Council, 1996) presents a holistic view of inquiry, which extends beyond an understanding of scientific methods. This course explores aspects of inquiry, beginning with an historical overview of inquiry in teaching science and then moving through the articulation in the NSES, the Colorado Model Content Standards in Science, district standards, and a reflective examination of research literature on inquiry in teaching and learning. This course will help any science educator examine practices of inquiry through instruction and learning and cultivate strategies to better implement inquiry in their own classrooms in support of learning science.

Employing a blended on-campus/online format, course participants will engage in and reflect on group activities that model inquiry-based instruction/learning, participate in group discussion (online and in-class), and explore current research and literature to develop a deeper understanding of inquiry's implications for both educators and students.

Course Objectives

Educators through this course will be able to:

1. articulate and operationalize inquiry in all aspects of science instruction;
2. analyze and design instructional experiences that promote inquiry;
3. identify teaching strategies supporting student inquiry and describe appropriate assessments for inquiry-based instruction;
4. reflectively examine and assess their personal inquiry knowledge and abilities;
5. describe instructional theory supporting inquiry-based strategies;
6. reflectively examine inquiry-based case studies and research literature;
7. defend curricular choices supporting inquiry-based learning based on reported research on learning, personal philosophy, and institutional goals; and,
8. provide content needed to enable practicing teachers to address K-12 Colorado Model Content Standards in Science, National Science Education Standards and Project 2061 Benchmarks.

Course Dispositions

Based on the UNC Conceptual Framework, course participants are expected to:

1. fully participate in all course experiences;
2. demonstrate an appreciation for academic understanding, knowledge, intellectual examination, and evidence-based decision-making;
3. reflect constructively about their personal experiences, identities as professionals, and beliefs about the profession; and
4. respect and model appropriate professional and ethical behaviors that embody their commitment to systematic research, educational inquiry, and practice.

Prerequisites

Undergraduate degree, teaching license (elementary, secondary, or K-12)

Format of Course

The nature of this class is that you will learn about inquiry through face-to-face interactions with learners and instructors, as well as engaging in a series of on-line lessons, asynchronous discussions and experiences with other course participants via Blackboard. The course will employ case studies, assigned readings, and a variety of activities to explore teaching strategies that support student inquiry, examine personal abilities to do inquiry, and analyze the nature of scientific inquiry. Participation and contributions to learning experiences and dialogue are essential to learning in this course.

The course requires some technical knowledge to facilitate its online delivery. You should be able to download and upload documents and spreadsheets from Blackboard, communicate in MS Word or other word-processing software, manipulate data in MS Excel or other spreadsheet application, download and use modeling software, and send and receive e-mail. While this course can be completed via 56K dialup modem, higher-speed access is recommended. You must have an Internet Browser and Microsoft Office (or equivalent). Some documents are available in the Adobe PDF format, so you must download the free Adobe® Reader® 7.0.

Survival tip

The strategy of scientific research and this class is to harness the power of collaboration. You are strongly encouraged to forge collegial relationships, both in and outside of class. You will be asked to

stretch your science knowledge, knowledge about inquiry, and your technological skills. Thus, frustration is the norm; proper self-management will lead to success.

Outline of Course Content

The *general* outline of topics is as follows:

1. Course introduction
2. Historical overview of inquiry
3. Instructional strategies and assessment to support student inquiry
4. Abilities to conduct inquiry
5. Nature of scientific inquiry
6. Analysis of science curricula and instructional materials

Grading and Attendance

The course grade will be based on the activities described below. In most cases, a scoring rubric will be provided for any assessment to guide your completion of assignments. This blended on-campus/on-line course requires student participation in course activities, discussions, and on-line experiences. Failure to participate in discussions or to complete assignments impacts the overall grade earned in this course.

Method of Evaluation

The course will be graded by standard A-F letter grades; students will be evaluated on the following:

Method of Assessment	*Approximate weight*
Active Participation in Online Discussions (i.e. post responses, engage in discussions, share contributions with class, etc.)	35%
Course Assignments	40%
Final Research Paper	25%

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

Class Discussion

Class discussion is probably the most important learning environment for this course. Scientists rarely work alone. You are strongly encouraged to form friendships that will enable you to collaborate on assignments as part of the class. All assignments will be submitted via Blackboard; due dates will be posted for each assignment. *Homework assignments will not be accepted late without prior approval. Missed class assignments will receive a zero score.*

Assignments

Case Studies

Using case studies, we will examine inquiry in K-12 science classrooms to build knowledge of inquiry as defined by the *National Science Education Standards*, *Benchmarks for Science Literacy*, and *Colorado Model Content Standards in Science*.

Inquiry-Based Investigations

To teach science as a process of inquiry, it is critical for you to experience first-hand the pleasure (and sometimes frustration) of conducting scientific investigations. The course investigations are a series of laboratory activities, field experiences, and computer simulations designed or selected to emulate the attributes of effective inquiry-based experiences. Some may take you through the hypothetico-deductive strategy of investigation (normally considered "scientific methods"), while others involve exploration and

observations. In some simulations/experiences, you will design experiments, test hypotheses; analyze data; and report results.

Research Paper

Select a topic of study for your classroom in the upcoming year that covers at least 2 weeks of teaching. Write a unit summary of the topic which includes your instructional goals and objectives, lesson plans, and assessment. In the unit describe how you have incorporated each of the inquiry elements covered in this course into your classroom learning experiences. After completing the instruction of the unit write a reflection on the incorporation of inquiry into your instruction, identify successes, options for change, and how you have changed professionally through this process. This project will fulfill requirements for a final and is due by 11/1/07. The unit should represent a logical, analytical assimilation of the concept of inquiry to support assertions related to effective inquiry practice. The unit and reflection should be between 5-7 pages in length, double-spaced, 12-pt font and model the elements of good grammar and mechanics.

***NOTE**: Additional Assignments may be added at the discretion of course instructors*

Using Blackboard

This course will use Blackboard, a web-based course supplement, to deliver much of the course material and to manage on-line quizzes and discussion. Quizzes will be posted at least two days in advance of their due date. *It is advised that you don't wait until the last minute to complete quizzes, since technical difficulties may arise to prevent you from completing quizzes on time.*

Blackboard access: http://bb.unco.edu.

Blackboard Login Instructions

1. Login with the first eight characters of your UNC-generated email address.
    a. Example: HIGG1234
2. Your password will be your student number. See Bear Number information.
3. If you have problems accessing Blackboard, contact User Support at 970 351-4357.

Disabilities

Students with disabilities who believe they may need accommodations in this class are encouraged to contact the Disability Support Services (970) 351-2289 as soon as possible to better ensure that accommodations are implemented in a timely fashion.

*****Links to UNC student handbook, honor code, and information on plagiarism. *****

Student Handbook: www.unco.edu/dos/handbook/stuhndbk.htm
UNC Honor Code: www.unco.edu/dos/honor_code.htm
Plagiarism: www.unco.edu/dos/plagiarism.htm

Library Services for Distance Education and Off-Campus Students: Obtaining Materials from UNC Libraries

Off-campus students residing within 50 miles of the UNC campus are required to come to the library and borrow materials in person. Students residing more than 50 miles from campus may request that materials be delivered to them. All requests must include complete citations. We will supply materials from the UNC Libraries, as well as materials from other libraries obtained via Interlibrary Loan. Articles will be delivered via email. Books will be mailed first class. Delivery time by U.S. postal service is

approximately 1 week. It is the responsibility of the student to return books by the date due. UNC does not pay return postage on books. For information on document delivery, call (970) 351-1446.

Requests for materials may be made through the following methods:

Online: http://www.unco.edu/library/forms/distancerequest.htm
By email: library.ocp@unco.edu
By fax: (970) 351-2540

Notice

The Office of Extended Studies reserves the right to cancel or reschedule courses based upon enrollment. Enrolled students will be contacted with information of any change.

Student Satisfaction Evaluation

Participants will be asked to evaluate the workshop for instructors' knowledge, interest and enthusiasm as well as providing additional information on classes or topics which you would like to see developed as a future offering from UNC.

Portable Electronic Devices

Please extend courtesy to your instructor and fellow students by turning off your portable electronic devises such as: cell phones, pagers, and IPods. Although not an audio issue, text-messaging is a distraction to other students and prevents you from full participation in class. You should keep your portable electronic devices in your backpack or purse during class. Your personal electronic devices should not be on your desks. If you know that you may need to accept an emergency phone call during class or if you have children in childcare or school, please let the instructor know. If you need to take a phone call during class, please step out of the classroom while you complete your call. Thank you for your cooperation.

Course Withdrawal Information

In accordance with University and Colorado Department of Higher Education policy, if you drop this class after the course starts you will be assessed a drop fee. The drop fee is pro-rated up to the half-way point in the class. You are legally responsible for payment of full tuition once 50% of this course has been concluded. In order to be eligible to receive any refund of tuition, you must contact the Office of Extended Studies (1-800-232-1749) to formally withdraw from your class. Your refund, if applicable, will be based on the date of contact with our office. Withdrawals received via telephone during non-business hours will be processed and dated on the next working day. Failure to notify us will result in UNC tuition being owed even though you do not attend or complete the coursework.