SCED 578, K-12 Science Inquiry (3 credits)
On-line Course
Summer 2015

Instructors: Dr. Teresa Higgins
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Email: teresa.higgins@unco.edu

Office Hours: By Appointment

Class Schedule: Jun 8-July 31, 2015
Online class meeting day/time: Tuesdays 1:00-3:30pm (or TBD by participant and faculty agreement.)

Required Texts and Readings:
   **Note: the next 2 texts are available online (free access at the website listed) or may be purchased:**

Suggested Texts and Readings:
8. 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 recent reforms to standards have emphasized a more diverse and detailed view to inquiry. The *Next Generation Science Standards* (NGSS Lead States, 2013) now refers to inquiry as “practices” and 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 online face-to-face interactions with learners and instructors, as well as engaging in a series of online 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.

Although this is an ON-LINE course, it is not an independent study. Please check the schedule for unit timelines. Everyone will move forward at the same pace. 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:

<table>
<thead>
<tr>
<th>Method of Assessment</th>
<th>Points each</th>
<th>Total possible points</th>
<th>Final Grade Weight</th>
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</thead>
<tbody>
<tr>
<td>Active Participation in Online Discussions – 16 online</td>
<td>25</td>
<td>400</td>
<td>40%</td>
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<tr>
<td>related discussions; assessed at the end of each unit</td>
<td></td>
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<tr>
<td>(i.e. post responses, engage in discussions, share</td>
<td></td>
<td></td>
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<tr>
<td>contributions with class, etc.)</td>
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<tr>
<td>Unit Assignments - 8 activity/research based experiences</td>
<td>50</td>
<td>400</td>
<td>40%</td>
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<tr>
<td>(1 per unit)</td>
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<td></td>
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<tr>
<td>Final Research Paper</td>
<td>200</td>
<td>200</td>
<td>20%</td>
</tr>
<tr>
<td>Total</td>
<td>---</td>
<td>1000</td>
<td>100</td>
</tr>
</tbody>
</table>
Note the following guidelines for submissions:

- Extra points available through additional and insightful posts 5 points each up to 10 points.
- Late posts will receive a 10% grade deduction for every 48 hour delay.
- Late submission of Unit Assignments will receive a 10% grade deduction for every 24 hour delay.
- Late submission of Final Project will receive a 10% grade deduction for every 24 hour delay.

Grading Scale:

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<thead>
<tr>
<th>Grade</th>
<th>Points</th>
<th>Points and Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>900 -1000</td>
<td>90-100%</td>
</tr>
<tr>
<td>B</td>
<td>800 - 899</td>
<td>80-89%</td>
</tr>
<tr>
<td>C</td>
<td>700 - 799</td>
<td>70-79%</td>
</tr>
<tr>
<td>D</td>
<td>600 - 699</td>
<td>60-69%</td>
</tr>
<tr>
<td>F</td>
<td>599 or below</td>
<td>59%</td>
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Assignments

Using readings and case studies, we will examine inquiry in K-12 science classrooms to build knowledge of inquiry as defined by the Next Generation Science Standards while understanding the influences of prior standards: 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.

Final Research Paper

The final project for the course is the development of a detailed proposal with rationale to build the inquiry presence within your current science program. Based on course readings, discussions and personal research of the literature you will create a plan that logically and systematically strengthens the inquiry of the science within one unit of study that you teach. For this paper you must identify the strengths and weaknesses of the current unit. Based on this analysis you will propose changes for instruction and provide detailed examples of lessons, objectives, assessments, etc. A template will be provided to assist with the final project.

**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](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](http://bb.unco.edu) 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](http://bb.unco.edu) (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](http://www.unco.edu/dos/handbook/stuhndbk.htm)
- UNC Honor Code: [www.unco.edu/dos/honor_code.htm](http://www.unco.edu/dos/honor_code.htm)
- Plagiarism: [www.unco.edu/dos/plagiarism.htm](http://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/distancerquest.htm](http://www.unco.edu/library/forms/distancerquest.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.

**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.