

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
SCHOOL OF EDUCATION
DEPARTMENT OF CURRICULUM AND INSTRUCTION

Course Syllabus – Spring 2006

1. **Course Prefix and Number:** CUI 632-01
2. **Course Title:** Trends & Issues in Science Education
3. **Credits:** 3:3
4. **Course Prerequisites/Co-requisites:** Admission to graduate school or permission of instructor
5. **For Whom Planned:** This course is a graduate-level course that is required for students in the Science Education Masters Program – Teacher Leadership Track and highly recommended for students in the Classroom Practice Track. It is also recommended for students interested in science enrolled in our Elementary and Middle Grades graduate programs. It is very appropriate for doctoral students interested in science education.
6. **Instructor Information:**
Catherine E. Matthews, Ph.D.
347 Curry: Science Education Lab, UNCG, Thursdays 5:00-7:50 PM
340 Curry Building, 334-3444
Email: cmatthews@uncg.edu Blackboard Course Page: blackboard.uncg.edu
Office Hours: By Appointment, Tuesdays 7:50 – 8:30 PM and Thursdays 2 - 3 PM
7. **Course Purpose/Catalog Description:** The purpose of this course is for science teachers/graduate students to focus on how research and theory in science education inform practice in the classroom. This course will focus on the idea of teacher as researcher. Each class member will be an active course participant and the course will be conducted as a seminar in science education.
8. **Teachers Academy Conceptual Framework Mission Statement:** The mission of professional education at UNCG is to prepare and support the professional development of caring, collaborative, and competent educators who work in diverse settings. This mission is carried out in an environment that nurtures the active engagement of all participants, values individual as well as cultural diversity and recognizes the importance of reflection and integration of theory and practice. UNCG's professional programs are guided by shared commitments to: (a) equity and excellence in teaching, research and service; (b) professional integrity and ethical deliberation in dealing with students and colleagues (university-based, school-based, and community-based); (c) the construction of a professional knowledge base through collaboration and collegiality; and (d) the dissemination of professional knowledge, skills and dispositions through the preparation and continuing professional development of teachers, principals and other school personnel.
9. **Course Goals and/or Objectives/Student Learning Outcomes:** In addition to being aligned with INTASC principles, ISTE/NETS and Advanced Competencies (see assignment descriptions), this course also incorporates the National Science Education Teaching Standards. These standards describe what science teachers at all grade levels should do.

COURSE OBJECTIVES: Course goals and objectives are based on the NC Advanced Competencies for teachers, which are in the MEd Handbook (updated 2005). The objectives of this course, CUI 632, are to introduce graduate students in science education to the professional literature, to read and discuss articles of interest, and to become familiar with notable authors whose writings are having or have had a major impact on science education. Inservice science teachers will:

1. Become knowledgeable of current science education research and the translation of science education theory into practice (what research says to the science teacher)
2. Read the professional literature and discuss critical issues in science education research
3. Read about and discuss the underlying nature of and assumptions of K-16 science instruction
4. Become knowledgeable about and participate (if feasible) in professional science education research organizations (e.g. NARST and AERA)
5. Conduct classroom action research projects in line with current interests in science education

6. Teaching Strategies: In this course, teaching strategies include cooperative learning, group presentations, individual presentations, inquiry learning approaches, technology integration, class discussions, readings, library sessions and independent research.

7. Evaluation Methods and Guidelines for Assignments: Grading: Attendance and class participation are critical components of this course. You are expected to attend and fully participate in each class session. More than one absence will affect your grade in this course. If you must be absent for any reason please notify the instructor by phone or email prior to your absence. Guidelines for assignments are enclosed.

This course is graded on the following system as described in the *Graduate School Bulletin*: A, superior; B, good; C, weak but acceptable on a limited basis for graduate credit and F, failure. Pluses and minuses are recorded and are used to calculate GPA. Guidelines for assignments are enclosed.

8. Required Texts/Readings/References:

All students must read *Science for All Americans* and at least one chapter from the *Handbook of Research on Science Teaching*, Weekly readings from the following Science Education journals should be completed: *Science Education*, *Journal of Research in Science Teaching*, *School Science and Mathematics* and *Journal of Elementary Science Education*. Other journals and journal articles may be approved. One dissertation in science education can also be used in lieu of a journal article and all doctoral students should read at least one dissertation.

9. Topical Outline: see attached course schedule

10. Other Information: This class will meet at the times and on the dates indicated on the course schedule. All assignments should be submitted on time. All assignments should be word-processed, spell-checked, checked for grammatical errors, **double-spaced** and conform to *APA Handbook* guidelines. All class members will abide by the UNCG Academic Honor Policy. All students are expected to attend each class session and be prepared for class discussion and class activities. More than one 3-hour absence from class will result in a lowered course grade, as it is

impossible to make up total class time missed in terms of class interaction and class discussion. Students who are not prepared for class in that they have not completed reading assignments or other non-graded assignments will be penalized in their grade for this course. Some assignments will also be submitted electronically, as a word file. Some assignments may be shared on Blackboard.

11. Recommended Text(s) and/or Readings:

Rutherford, F. & Ahlgren, A.. (1990). *Science for All Americans*. New York: Oxford University Press.

12. Alignment with State and National Standards: See course goals/objectives and individual assignment descriptions and matrix.

Tentative Course Outline

Session	Date	Topic
1	Jan. 12	First Day of Class, Introductions, Journal Assignments The practitioner literature versus the research literature: comparisons using a Venn Diagram. (An example from each type of literature) Introduction to the science education research literature, discussion of interests and expectations, the <i>Handbook of Research on Science Teaching</i> , NARST and AERA meeting details. Generating a list of publications where one is likely to find research in science education. Qualitative Research vs. Quantitative Research in JRST
2	Jan. 19	Report on Journal Assignments/Read and further discuss articles from last week, Dissection of a research article activity
3	Jan. 26	First Session at CITI Lab in Jackson Library with Gerald Holmes Expert searching techniques, Sign up for Ingenta TOC alerts Trends & Issues in the Science Education Literature Assignment Using Ulrichs (if students had trouble)
4	Feb. 2	Report on Trends in Major Science Education Journals Your selected journal article presentations in small groups JRST Anniversary Issue presentations (concurrent sessions)
5	Feb. 9	Action Research, What is it and How do I do it?
6	Feb. 16	Issues in Science Education Research/Seminar Sessions led by Students Handbook Chapter presentations (talking points due Feb 9 th)

- 7 Feb. 23 Second Session at CITI Lab in Jackson Library
Social Science Citation Index and its usefulness to researchers
Work with Gerald Holmes in Jackson Library.
- 8 March 2 Issues in Science Education Research/Seminar Sessions led by Students
March 9 *Spring Break, no class tonight*
- 9 March 16 Issues in Science Education Research/Seminar Sessions led by Students
(Author reports due)
- 10 March 23 Issues in Science Education Research/Seminar Sessions led by Students
- 11 March 30 Online session tonight or collaborative work session on action research project
- 12 April 6 Third Session at CITI-Lab Topic and Researcher Specific Searches and
Reports, End Notes
NARST April 3 – 7th, AERA April 7 – 11th
April 13 *no class, Guilford County Schools Spring Break*
- 13 April 20 Issues in Science Education Research/Seminar Sessions led by Students
- 14 April 27 Last class session, Share Action Research Results
- 15 May 4 Final exam period, Share Action Research Results
Course Evaluations
All remaining course assignments due!

Criteria for Evaluation of Student Performance in CUI 632

Course grades will be based partially on class attendance and participation (30% of your final grade, 1% for attendance each class session, 1% for participation each class session). This course will be conducted as a seminar and all class participants must bear responsibility for class presentations, readings and discussions. It is important that you prepare for class by completing readings prior to class meetings and accept responsibility for leading discussions in class on chapters or assigned readings for the class.

Each class member is expected to be reading journal articles, books, and related materials throughout the course. Each class member should compile a collection of articles and personal reflections and reactions to the articles in a three-ring binder to be submitted at the end of the course. This binder should also include articles distributed in class and a brief reflection on our class discussions. We will be using some in-class time to work on various activities, which should be completed and included in your binder. A midterm check of the binders will be completed in order to give you guidance with respect to entries and a midterm evaluation of your work on the binder.

All students are required to complete the following activities to total 100%.

- Prepare your journal report, share it in class, upload it to BB. Choose an article from the journal that you are interested in and lead a short seminar (whole class or most likely small groups) on the article including preparing guiding questions for others who will be reading the article. (10%) Report due January 19th and a copy of the questions and reference for your selected article.
- Choose one chapter from the *Handbook of Research on Science Teaching*. Photocopy it for your binder, read and summarize the chapter and your reactions to the chapter. Be prepared to share this information with the class. (10%)
- Conduct an extensive review of the literature in science education on a topic that is of interest to you. Please obtain the instructor's approval before you begin your search. (10%)
- Conduct an author search of a notable science educator using the *Social Science Citation Index*. Write a brief paper (~5 pages), which describes this author's work and the work of others that they have used to build on and any others who may have been inspired to use the work that they have accomplished. (10%)
- Prepare and conduct an action research project with your students, classes, and /or curriculum this semester. Write a paper that describes your research project and reports your results. Prepare a PowerPoint presentation or a tri-fold display board to use to share your work with our class. (30%)

Collaborative Class Action Research Project (possible, discuss options with class)

**Interstate New Teacher Assessment and Support Consortium (INTASC)
Model Standards for Beginning Teachers Licensing and Development
(Undergraduates and CPT Graduate Students)**

Principle #1- CONTENT PEDAGOGY

Principle #2 – STUDENT DEVELOPMENT

Principle #3 – DIVERSE LEARNERS

Principle #4 - CRITICAL THINKING

Principle #5 - MANAGEMENT AND MOTIVATION

Principle #6 – COMMUNICATION AND TECHNOLOGY

Principle #7 - PLANNING

Principle #8 - ASSESSMENT

Principle #9 – REFLECTIVE PRACTICE AND PROFESSIONAL DEVELOPMENT

Principle #10 – SCHOOL AND COMMUNITY INVOLVEMENT

**ISTE's NETS (National Educational Technology Standards for Teachers)
(Undergraduates and CPT Graduates)**

I. Teachers demonstrate a sound understanding of technology operations and concepts.

II. Teachers plan and design effective learning environments and experiences supported by technology.

III. Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning.

IV. Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.

V. Teachers use technology to enhance their productivity and professional practice.

VI. Teachers understand the social, ethical, legal, and human issues surrounding the use of technology.

Research Journals in Science Education (19)

The Electronic Journal of Science Education

Instructional Science

International Journal of Math and Science Education

International Journal of Science Education

International Research in Geographical and Environmental Education

Journal of Biological Education

Journal of Computers in Mathematics and Science Teaching

Journal of Elementary Science Education

Journal of Environmental Education

Journal of Research in Science Teaching (National Association for Research in Science Teaching)

Journal of Science Education and Technology

Journal of Science Teacher Education (was AETS now)

Research in Science & Technological Education

School Science and Mathematics (School Science and Mathematics Association)

School Science Review

Science & Education (official journal of The International History, Philosophy, and Science Teaching Group)

Science Education

Science Education International (quarterly journal published by International Council of Associations for Science Education (ICASE))

Science Education Reform

Other Research Journals where Science Education articles are published (7 plus many more, list to be generated by CUI 632 class)

Elementary School Journal

American secondary education

High School journal

Journal of environmental education

Journal of experimental education

Journal of the Learning Sciences

Constructivist Foundations (e journal)

Practitioner Journals in Science Education (24)

American Biology Teacher (National Association of Biology Teachers)

Bioscene-Journal of College Biology Teaching

Cell Biology Education (articles on life science education at the K-12, undergraduate and graduate levels)

The Chemical Educator

Earth and Space

The Earth Scientist (National Earth Science Teachers Association)

The Electronic Journal in Science and Literacy Education

Investigations in Science Education (Investigações em Ensino de Ciências)

Journal of Chemical Education (American Chemical Society)

Journal of College Science Teaching (National Science Teachers Association)

Journal of Geological Education (National Association of Geology Teachers)

Journal of Physics Teacher Education Online

Microbiology Education Journal

The Physics Teacher (American Association of Physics Teachers)

Quantum

Science activities

Science and Children (K-6 School Science Journal, National Science Teachers Association)

Science Education Review, a practitioner's journal for elementary and secondary science teachers.

Science Scope (Grades 4-8 School Science Journal, National Science Teachers Association)

The Science Teacher (Secondary School Science Journal, NSTA)

The Space Educator (National Space Society)

Journal of Natural Resources and Life Sciences Education (JNRLSE), an international journal which contains the latest teaching ideas in the life sciences, natural resources, and agriculture. A special section of the journal emphasizes K-16 science education

Foundations of Chemistry, a journal devoted to the history and philosophy of chemistry, which from time to time includes articles devoted to pedagogical issues

Journal of Cities and the Environment, a web based journal that has an education section that will focus on the sharing of educational research that contributes to our knowledge of how students understand the environment, their perceptions and beliefs regarding the environment, impact of environmental education programs/curricula on student outcomes, professional development models that support teachers in implementing environmentally focused programs in their schools;

International Science Education Journals (11)

Gamtamokslinis Ugdyimas/Natural Science Education is a periodical, peer reviewed, scientific-methodical journal, issued by the SMC "Scientia Educologica". It is an international journal, wherein the scientific and methodical articles published in Lithuanian, English and Russian languages.

Journal of Baltic Science Education

Canadian Journal of Science, Mathematics and Technology Education

Information about KHIMIYA/CHEMISTRY, ISSN 0861-9255, the Bulgarian Journal of Chemical Education, is available by contacting the editor, Professor B.V. Toshev, at toshev@chem.uni-

sofia.bg. Manuscripts may be written in either Bulgarian or English.

Research in Science Education, the official journal of the Australasian Science Education Research Association (ASERA)

Chinese Journal of Science Education (The Association of Science Education Taiwan)

Journal of Science Education (bilingual international journal with peer-evaluated articles)

Investigations in Science Education (Portuguese journal devoted to research in science education)

Eurasia Journal of Mathematics, Science and Technology Education (EJMSTE), a new academic journal devoted to the publication of research articles on all aspects of mathematics, science and technology education.

Brazilian Journal of Physics Teaching (Revista Brasileira de Ensino de Física)

Chemistry Education (Educacion Quimica)

The Journal Report (due second week of class, will be shared orally and posted on Blackboard)

Title of the Journal

Organization that publishes the journal

Focus of the journal

Date publication began

How frequently is the journal published?

Circulation (check Ulrichs...Jackson Library...databases...U for Ulrichs)

Peer Reviewed (Yes/No/Blind/Double Blind)

Website for information about the journal/organization that publishes the journal

Does Jackson library have hard copies/electronic copies available through Journal Finder?

List the titles and authors of all articles published in this journal last year (2005).

Identify the themes (if any) that you can discern from the list of article titles. Describe the theme(s) in a brief paragraph or two.

Does each article have an abstract? (If so, read the abstracts to help you further identify any themes from this past year's issues)

Were there authors who published more than one article in this year this year? (If so, give their names and institutional affiliations)

Choose one article that you are most interested in and bring a hard copy of that article to class. Read the article and in a brief paragraph or two summarize the article and tell why it is of interest to you.

Acceptance Rate of articles submitted

Articles in JRST's Anniversary Issue

1. Novak
2. Piaget
3. M. B. Rowe
4. Lawson & Wollman
5. Karplus
6. Kahle & Lakes
7. Shymansky
8. Hewsons
9. Tobin and Gallagher
10. Roth & Roychoudhury
11. Trowbridge & Wandersee
12. Lewis & Linn
13. Baker & Leary

Teachers as Researchers (Practitioner Research)

Emily van Zee, University of Maryland, College Park

What are you curious about your students' learning? How might you explore that? What assistance might you need? What kinds of data might you collect? How might you interpret those data? How can you use these interpretations to improve your practices? To whom might you communicate your findings? When, where, and how? These are some of the issues that "practitioner researchers" consider as they formulate questions about their own practices, collect and interpret relevant data, and communicate with others. Practitioners may be K12 teachers, science specialists, administrators, college science faculty, science education faculty, informal science educators, and organization officials. Practitioner research is also known as action research, reflective research, teacher research, self-study, and the scholarship of teaching and learning.

Action Research International

Educational Action Research

Handbook of research on science teaching and learning: A project of the National Science Teachers Association. / edited by Dorothy L. Gabel. New York: Macmillan; Toronto: Maxwell Macmillan Canada; New York: Maxwell Macmillan International, c1994.

Chapter 1	Research on Science Teacher Education
Chapter 2	Research on Instructional Strategies for Teaching Science
Chapter 3	Research on Using Laboratory Instruction in Science
Chapter 4	Research on the Acquisition of Science Knowledge: Epistemological Foundations of Cognition
Chapter 5	Research on Alternative Conceptions in Science
Chapter 6	Research on the Affective Dimension of Science Learning
Chapter 7	Research on Problem Solving: Elementary School
Chapter 8	Research on Problem Solving: Middle School
Chapter 9	Research on Problem Solving: Earth Science
Chapter 10	Research on Problem Solving: Genetics
Chapter 11	Research on Problem Solving: Chemistry
Chapter 12	Research on Problem Solving: Physics
Chapter 13	Research on Goals for the Science Curriculum
Chapter 14	Research on Assessment in Science
Chapter 15	Research on the History and Philosophy of Science
Chapter 16	Research on the Uses of Technology in Science Education
Chapter 17	Research on Classroom and School Climate
Chapter 18	Research on Gender Issues in the Classroom
Chapter 19	Research on Cultural Diversity in the Classroom