I. Course Description

This is a fully online course (100% online) and is designed for graduate students and accommodates master’s and doctoral degree students in Teacher Education and other colleges on the campus who are interested in enhancing their science teaching skills. The major goal is to prepare teachers who can educate students to become scientifically literate. This aim requires educators who possess the competence to help students learn about the nature of science, to engage in science investigations, and to construct understanding of natural phenomena, forming an elaborate cognitive framework of scientific concepts.

II. Course rationale

Pre-service teachers are immersed in science education to enhance their science content knowledge and pedagogical skills. This science methods course aims to lay a foundation of professional knowledge, skills, attitudes, behaviors and dispositions necessary for the teaching profession. This course will span the history of science education, explore the nature of science, and inform the practice of teaching science through inquiry and investigation. In addition, the student will become knowledgeable of the state adopted proficiencies for teachers (science emphasis), state standards for science (science TEKS), as well as, the Next Generation Science Standards (NGSS), the national science education standards. This course for preservice teachers provides an effective stepping stone towards developing the fundamental knowledge and skills the gaining increased knowledge TAMU-CC Teacher Education program.

According to Chiappetta (2011), the challenge has never been greater to educate a society for the electronic/communication/information age of the 21st century. This is especially challenging in a highly multiethnic society with students coming from a variety of cultures and a range of economic backgrounds. Science teachers cannot be too well prepared. They must be very knowledgeable about science and technology, expert in
pedagogy, and highly motivated to elevate the scientific and technological literacy of society and to help their students succeed academically.

The importance for science teachers to understand the nature of science cannot be overstated. After all, science is what they are teaching and it is critical to know about this discipline – a clear definition of science; about pseudoscience, junk and corrupted sciences; skepticism; the various methods of science; science facts, laws, and theories; and how science is related to engineering, technology and society. Many practicing science teachers, as well as beginning science teachers, lack an understanding of many of these ideas. Also, most science courses at the K-16 levels teach very little “about” the nature of science, devoting most of the instruction to the content of science. Where is the subject matter balance in these courses?

Teaching science as a body of knowledge results in conveying the abstracted, distilled, polished, and pristine outcomes of the learning process that others have gone through to construct new knowledge. As a consequence, this approach often produces learning outcomes that have little meaning to students, resulting in the “rote” memorization of ideas that are learned poorly. Content with little or no process is not the recommended approach for science education. For these and many other reasons, science teachers should learn a great deal about teaching “science as an inquiry” philosophy and related instructional approaches.

III. State Adopted Proficiencies for Teachers

1. Learner-Centered Knowledge: The teacher possesses and draws on a rich knowledge base of content and technology to provide relevant and meaningful learning experiences for all students.

2. Learner-Centered Instruction: The teacher collaboratively identifies needs and implements appropriate pedagogical and assessment strategies using technology and other resources.

3. Equity In Excellence For All Learners: The teacher respects, addresses, and validates the needs of diverse learners.

4. Learner-Centered Communication: The teacher demonstrates effective professional and interpersonal communication skills and serves as an advocate for all students.

5. Learner-Centered Professional Development: The teacher is a reflective practitioner and demonstrates a commitment to learn, to improve the profession, and to maintain professional ethics and personal integrity.

Texas Education Agency STAAR Proficiencies, TExES Competencies, Texas Science Objectives, Science Common Standards:

<table>
<thead>
<tr>
<th>State Science Standards/Course Goals</th>
<th>Course Assignments</th>
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| **Standard I.** The science teacher manages classroom, field, and laboratory activities to ensure the safety of all students and the ethical care and treatment of organisms and specimens. | • Reading Reflection  
• Safety Unit |
**Standard II.** The science teacher understands the correct use of tools, materials, equipment, and technologies.

- Reading Reflection
- Science Process Skills
- Inquiry Curriculum Unit

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

- Reading Reflection
- Science Fair Project
- Inquiry Curriculum Unit

**Standard IV.** The science teacher has theoretical and practical knowledge about teaching science and about how students learn science.

- Article Reflection
- Inquiry-based Lesson Plan
- Science Journal
- Science Fair Project
- Research Paper
- Inquiry Curriculum Unit

**Standard V.** The science teacher knows the varied and appropriate assessments and assessment practices to monitor science learning.

- Article Reflection
- Science Journal
- Science Fair Project
- Inquiry Curriculum Unit

**Standard VI.** The science teacher understands the history and nature of science.

- Article Reflection
- Cube Activity
- VNOS Assessment

**Standard VII.** The science teacher understands how science affects the daily lives of students and how science interacts with and influences personal and societal decisions.

- Article Reflection
- Science Journal
- Science Fair Project
- Inquiry Curriculum Unit

**IV. Course Objectives/Student Learning Outcomes:**

The intended learning outcomes specified for these units will be assessed from summaries of Instructional Objectives and submitted to the course Blackboard site and during question-and-answer sessions in class. All of the Instructional Objectives may be assessed on a semester test and the final exam.

This course is designed to enable learners to:

1. Characterize the nature of science, scientific knowledge, and scientific inquiry.
2. Read peer-reviewed, scholarly articles on current trends and issues in science education.
3. Identify activities where children learn to utilize science process skills.
4. Explain how children construct science knowledge with reference to theories of cognitive psychologists.
5. Identify instructional models appropriate for teaching inquiry science.
6. Construct questions and responses to guide scientific inquiry.
7. Design lessons to promote scientific inquiry.
8. Plan to successfully manage a science classroom.
10. Identify the “big ideas” of the grade level science TEKS in planning for inquiry.
**Student Learning Outcomes:**
Graduate students will be able to:
1. Explain the history of science education.
2. Discuss the foundations for teaching science: nature of science, inquiry and teaching science.
3. Plan, design and assess science instruction to promote student learning among diverse student populations.
4. Participate in the discourse on current trends and issues in science education.

**V. Course Topics:**
Course topics include, but are not limited to:
- What is Science?
- History of Science Education
- Nature of Science
- Science as a Way of Thinking,
- Science as a Way of Investigating,
- Science as a Body of Knowledge
- Science as Social Interactions
- Science and Society
- Scientific Inquiry and Teaching Science
- Science Process Skills
- Engineering and Technology
- Planning to Teach Science
- Assessing Science Learning
- Teaching Science
- Science Fair Projects
- Learning Cycle
- 5E Instructional Model
- Diverse Student Learners and Differentiated Instruction

**VI. Instructional Methods and Activities**
- Traditional experiences (reading assignments, journal article reviews, written assignments)
- Online discussions via Blackboard (assignments, discussions, chat, wikis and other interactions).

**VII. Evaluation and Grade Assignment**
*The methods of evaluation and the criteria for grade assignment are:*

**Weekly Unit Assignments (25%)**
Students will complete weekly unit assignments on the topics covered in the course outline. More specific details about these assignments will be provided on Blackboard (Bb).

**Readings/Article Reviews on Discussion Board (20%)**
You will be a part of a Professional Learning Community (PLC) by responding to various questions and posts on the discussion board via Blackboard (Bb). The promptness and initiative of participating in threaded discussions done in a timely fashion will demonstrate self-motivation. The delivery of your posts will address your attention to detail in terms of being grammatically correct with rare
misspellings. You will make posts that are relevant to the original discussion by staying on topic. By contributing to the professional learning community, you will demonstrate an effort to further the development of a collaborative learning experience.

**Synthesis Paper & Lesson Plan – Scientific Concept/Theory/Law (30%)**
Students will select a specific science concept/theory/law. Students will research this concept/theory/law and make connections to NOS and scientific inquiry. They will explore the history of this concept and write a synthesis paper. Students will then develop an inquiry-based science lesson plan that incorporates aspects of NOS and the history of this concept/theory/law. Students will designate a specific grade level for their lesson plan based on the state science TEKS. More details about this assignment will be provided on Blackboard (Bb).

**Midterm/Final Exams (25%)**
Students will be assessed over instructional objectives related to NOS and scientific inquiry.

Grading: EDUC 5356

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<tr>
<th>Assignment</th>
<th>Percentage</th>
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<tr>
<td>VNOS-C Questionnaire</td>
<td>** 2(Required)</td>
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<tr>
<td>Weekly Module Assignments</td>
<td>25</td>
</tr>
<tr>
<td>Readings/Articles/Discussion Board Posts</td>
<td>20</td>
</tr>
<tr>
<td>Synthesis Paper + 5-E Inquiry-Based Lesson Plan</td>
<td>30</td>
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<tr>
<td>Midterm/Final Exams</td>
<td>25</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100 Points</strong></td>
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**B. Grading Scale**

Grades:
A = 92% - 100%
B = 84% - 91%
C = 76% - 83%
D = 68% - 75%

**VIII. Course Schedule and Policies**
A. A tentative course schedule will be uploaded to Blackboard (Bb) prior to the first day of class.
B. **Mon., July 7** – First day of class.
C. **Tues., Aug. 26** – Last day of class.
B. Class Policies

Late assignments
Late assignments will not receive full credit. A deduction of 10% per day will be applied to any late assignment. Communicating an excuse for a late assignment does not constitute a waiver of the deadline or avoid the deduction.

Attendance/tardiness
Attendance will be recorded for this class. Points will be deducted for class absences. Notification of an absence does not constitute a class waiver.

Late work and Make-up Exams
Full credit will not be given for late assignments or unexcused missed conference.

Extra Credit
Extra credit is not an option for this course.

X. Textbook(s) (Required)


XI. Bibliography

The knowledge bases that support course content and procedures include:


Journals:
Selected readings from the professional journals Journal of Science Teacher Education, Journal of Research in Science Teaching, School Science and
Mathematics, Science and Children, Science Scope, The Science Teacher, and Phi Delta Kappan, will be incorporated into the course content.

XII. Course Policies

Academic Integrity/Plagiarism
University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one's own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in failure. See website http://judicialaffairs.tamucc.edu/.

TAMU-CC students, undergraduates as well as graduate students, are expected to know what plagiarism is and also how to avoid it. In your scholarly writing for this course, you must credit sources, including articles, books, and web pages, and provide quotation marks for material that is quoted directly.

If you have questions about what plagiarism is, I suggest that you consult the following sites:
http://www.plagiarism.org/  http://owl.english.purdue.edu/ow/589/01/
http://www.macloo.com/cheat/general.htm
http://www.utoronto.ca/writing/plagsep.html
http://people.brandeis.edu/~teuber/useplagiarism.html
http://www.unc.edu/depts/wcweb/handouts/plagiarism.html
http://firstyear.tamucc.edu/wiki/Resources/AboutPlagiarism

Dropping a Class
I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with me before you decide to drop to be sure it is the best thing to do. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Check the university academic calendar website for dates related to dropping a class with an automatic grade of "W" this term. See website http://www.tamucc.edu/academics/academic_cal.html.

Preferred methods of scholarly citations
Publication Manual of the American Psychological Association, Sixth Edition is the preferred method for citations within papers.

Classroom/professional behavior
All students are expected to act in a responsible manner with consideration of fellow students and toward TAMU-CC faculty and staff members. Specific rules and information is available in the TAMU-CC Student Handbook and available through the website [http://judicialaffairs.tamucc.edu/studentcofc.html](http://judicialaffairs.tamucc.edu/studentcofc.html).

**Statement of Academic Continuity**

In the event of an unforeseen adverse event, and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

**Grade Appeals**

As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule 13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules Web site at [http://www.tamucc.edu/provost/university_rules/index.html](http://www.tamucc.edu/provost/university_rules/index.html). For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.

**Disabilities Accommodations**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in CCH 116. See website [http://disabilityservices.tamucc.edu/](http://disabilityservices.tamucc.edu/).

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.