TEXAS A&M UNIVERSITY-CORPUS CHRISTI
College of Education, Department of Curriculum and Instruction

EDCI 5390/6390 – Trends and Issues in Science Education

Course Syllabus – Spring 2016

Course Instructor: Tonya D. Jeffery, Ed.D.
Course Location: ECMS – Rm. 114
Course Meets: Mondays, 7:00pm - 9:30pm
Office Location: Faculty Center 249
Office Hours: Tuesdays, 4:30PM – 6:30PM in FC-236; Wednesdays, 4:30pm – 6:30pm in ECMS (2nd Flr Science Fair Offc.), or by appointment
Office phone: (361) 825-2453
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I. Course Description

This is a blended course (50% online, 50% face-to-face) and is designed for graduate students and accommodates masters and doctoral degree students in Curriculum & Instruction 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 past and current trends and issues in science, the nature of science, to engage in science investigations, and to construct understanding of natural phenomena, forming an elaborate cognitive framework of scientific concepts. This class will meet face-to-face every other week.

II. Rationale

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.

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 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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</table>
| **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. | • Article/Reading Reflection  
• [Discussion Board (DB) Posts]  
• Scientific Inquiry Investigations & Reflections  
• Video Assignments |
| **Standard II.** The science teacher understands the correct use of tools, materials, equipment, and technologies. | • Article/Reading Reflection - DB Posts  
• Science Process Skills  
• State Standards (Process/Content TEKS)  
• National Standards (NGSS)  
• Scientific Inquiry Investigations & Reflections  
• Video Assignments |
| **Standard III.** The science teacher understands the process of scientific inquiry and its role in science instruction. | • Article/Reading Reflection - DB Posts  
• Scientific Inquiry Investigations & Reflections  
• State Standards (TEKS)  
• National Standards (NGSS)  
• Inquiry Curriculum Unit  
• Inquiry-based Lesson Plan  
• Video Assignments |
**Standard IV.** The science teacher has theoretical and practical knowledge about teaching science and about how students learn science.

- Article/Reading Reflection - DB Posts
- Inquiry-based Lesson Plan
- Scientific Inquiry Investigations & Reflections
- DAST
- Synthesis Paper
- Inquiry-based Lesson Plan
- Video Assignments

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

- Article/Reading Reflection - DB Posts
- Science Journal
- Science Fair Project
- Inquiry Curriculum Unit

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

- Article/Reading Reflection - DB Posts
- Scientific Inquiry Investigations & Reflections
- State Standards (TEKS)
- National Standards (NGSS)
- Synthesis Paper
- Video Assignments

**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/Reading Reflection - DB Posts
- Scientific Inquiry Investigations & Reflections
- Science Journal
- Synthesis Paper
- Video Assignments

**IV. TExES Competencies**

This course is designed for preservice and/or inservice teachers who are interested in increasing their self-efficacy and professional development in science education.

**V. Course Objectives and Learning Outcomes**

The (behavioral and conceptual) objectives of this course include (but are not limited to) the following:

- Students will demonstrate comprehension of contemporary recommendations and goals of the State and National Science Standards and Associations.
- Students will evaluate the efficacy of the above goals and trends with respect to their areas of classroom teaching and local school systems.
• Students will develop a personal model of scientific literacy that reflects the nature of science and its effect on classroom pedagogy.

• Students will critically examine, observe, analyze, and reflect on current trends in the research and related literature base and in the classroom.

• Students will design and construct a research-based informed project that demonstrates the application of research-driven knowledge to practice in science-based classrooms.

Content Outline: Inasmuch as a large portion of this course is generative, exploratory, experimental, and field-based in nature, only a general outline of topics can be provided at this time. Students play a central role in the decisions concerning the topical nature and structure of this course.

I. Introduction and Historical Perspectives of Science Trends
II. Analysis of Personal Reflections of Contemporary Science Education Goals
III. Reform Issues, Trends and Goals at the National Level and Its Impact on Classrooms
IV. Myths of Science and Science Education
V. A Brief Introduction into the Nature of Science
VI. Analyses of Contemporary Research Related to Current Trends in Science Education (STEM, Diversity, Equity, Social Justice, etc.)
VII. Constructing a Theory-Driven Research Field-Based Science Education Observations
VIII Reports and Dissemination of Field-Based Science Education Observation

Instructional Activities and Experiences

1. Complete a 12-item “Myths of Science Quiz.” This true/false instrument stimulates a great deal of discussion about science, revealing many misunderstandings of this broad human enterprise.

2. Summarize the Instructional Objectives for the unit to provide the scope and importance of the content. Participants will submit assignments within each unit to Blackboard (Bb).

3. Conduct a guided reading session highlighting important learning outcomes for the study of the nature of science.

4. Review the state science standards (TEKS) and Next Generation Science Standards (NGSS) to highlight the nature of science, and NGSS components, such as Science as Social Interaction, Engineering and Technology, and Science and Society.
5. Read various peer-reviewed journal articles that cover current trends and issues in science education, nature of science, and scientific inquiry.

6. During class sessions the instructor will model many of the learning outcomes stated in the objectives.

7. Many science demonstrations and model lessons will be conducted in class, involving learning “science as inquiry” and “nature of science” with high student engagement for learning science content and science processes.

8. The course participants will read vignettes in the assigned textbook in class, reflecting on certain aspects of inquiry and teaching science.

9. Participants will summarize the instructional objectives and submit them to Blackboard for feedback in order to increase and reinforce their understanding of the topic.

10. Students will participate in a service learning project (Coastal Bend Regional Science Fair) and submit a reflection of this experience.

Assessment of the Instructional Objectives/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.

VI. Course Topics

Course topics include, but are not limited to:

- What is Science?
- 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
- Engineering and Technology
- Science and Society
- Scientific Inquiry
- Discovery Learning
- Open Inquiry
- Guided Inquiry
- Science by Inquiry
- Science as Inquiry
- Deductive vs. Inductive Activities
- Science Fair Projects
- Learning Cycle
- 5E Instructional Model

VII. Instructional Methods and Activities

- Traditional experiences (reading assignments, journal article reviews, written assignments, demonstrations, labs, presentations)
Online discussion via Blackboard (assignments, discussions, blogs, and other interactions).

**VIII. Evaluation and Grade Assignment**

*The methods of evaluation and the criteria for grade assignment are:*

**Attendance and Participation (30 pts)**
You are expected to attend all class meetings and participate in our weekly discourse on teaching science, nature of science, and scientific inquiry.

**Chapter Readings/Article Reviews (50 pts)**
You will be a part of a Professional Learning Community (PLC) by responding to various questions and posts on the Discussion Forum 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. You will write a **one-paragraph reflection** that addresses a given prompt. Then you will review two other students' postings and post one response/comment to each student's post (Total of two replies). Your replies to other students’ posts only need to be about 1-2 sentences. You can feel free to provide/post responses to more than two classmates' postings to enhance a discussion; however, you will only receive credit for replying to two classmates' posts. Remember to be courteous and respectful to all peers and in your responses to postings. Professionalism is expected at ALL times.

**Analysis Paper of Personal Reflections of Contemporary Science Education Goals (25 pts)**
You will submit an analysis of your person reflections of current science education goals. More details will be provided in class.

**Research-Based Project for Classroom Implementation (50 pts)**
Students will engage in a research-based project that involves classroom implementation. More details will be provided in class.

**Scientific Claims/Issues Investigation (50 pts)**
You and a partner will select a scientific claim from advertisements, commercial products, magazines, brochures, etc. to explore. Socioscientific issue (SSI) investigation stresses the organization of factual information as well as the presentation of arguments and evidence. The investigation and analysis of SSI requires students to engage in inquiry and to find out about ideas by doing research using the library, internet, field work and by determining other people’s beliefs and attitudes. It also encourages students to separate fact from opinion and
to become aware of the values held by people who disagree with them. The investigation of SSI culminates in students becoming more scientifically literate in making informed decisions that affect their lives and the lives of others. Please review Chapter 12 in your course textbook as a reference for information on SSI. A list of topics for you and your partner to choose from will be provided to you in class. You will present your Scientific Claims Investigation in class.

Midterm Exam (100 pts)
Students will be assessed over instructional objectives related to current trends and issues in science education. Midterm exam will take place in class.

Synthesis Paper & 5-E Lesson Plan – Scientist (75 pts)
Students will complete a synthesis paper exploring the life of a scientist in their content area AND develop a 5-E lesson plan centered on this person. Collaboration is essential in education; therefore, this assignment will be a group effort. Teams of two to three students will write the research paper and develop a collaborative lesson plan. The research paper will be presented in class and the lesson will be conducted in class and evaluated by your peers.

Students will select a scientist, explore the life of this scientist, contributions to science (concept/theory/law/etc.), and their impacts on society. Students will write a 7-10 page synthesis paper (minimum 7 pages, not including title and reference page).

Synthesis Paper (50 pts):
1. Scientific theory/law must be approved by instructor.
2. Paper should be a minimum of 7 pages, but no more than 10 pages. Use at least 6 references, with a minimum of 3 peer-reviewed articles from professional educational journals, written within the past five years, and books.
3. The paper must include the following subheadings in bold:
   1. Title Page – Include name of concept/theory/law, your name, course name, my name, semester/year (Cover Page)
   2. Introduction – Discuss your motivation/personal interest for selecting this theory/law; What is the importance of educating students about this theory/law? (Pages 1-2)
   3. Review of the Literature – Discuss the historical development and/or timeline of concept/theory/law; What scientist(s) is/are credited for proposing the concept or contributing to the concept; Biography of the scientist(s) – what type of person was this scientist (discuss childhood through adulthood); What scientific processes did the scientist(s) utilize in proposing this concept?; Include images of the scientists; How did this theory/law affect personal and societal decisions; What were some of the
challenges (if any) in society accepting this theory/law? (Pages 3-6)

4. Discussion - Discuss how students’ understanding of the nature of science will be improved by learning about these scientists and the historical development of their contribution(s) to science (e.g. teaching science through the history of the discipline); Consider and address the connections you can make to the nature of science themes when teaching a lesson on this scientist/concept, as was discussed earlier in the semester: science is a way of knowing, scientific knowledge is based on empirical evidence, scientific knowledge is open to revision in light of new evidence, science is a human endeavor, science addresses questions about the natural and material world, etc. (Pages 7-8)

5. Conclusion - Explain why it is necessary to incorporate critical aspects of a scientists’ life when teaching and learning in the science classroom. Make reference to the state TEKS, national science education standards, 5-E instructional model. Discuss your ideas for sharing your lesson plan, utilizing this project with other science teachers at your campus. (Pages 9-10)

6. References – Final page of paper; 12 pt. font, single-spaced (Final page)


5. Paper should be written in Times New Roman, 12 pt. font. double-spaced.

6. Research Paper + Lesson Plan

7. 5-E Lesson Plan (25 pts):

Students will analyze their current or future classroom practices as they relate to the research-based instructional approaches discussed in the course. Students will then develop an engaging, inquiry-based science lesson plan (5-E) that incorporates aspects of NOS and the scientist/concept researched. Students will designate a specific grade level for their lesson plan based on the state science TEKS and NGSS, utilizing science process and concept TEKS. A 5-E lesson plan template will be provided. This lesson will be conducted with your peers in class and evaluated according to a class-developed rubric.

Reflective Journals (20 pts)

Teacher as a reflective practitioner. The purpose of this assignment is to engage you in reflective exploration of your practice, the curriculum orientation(s) under which you make decisions, and possible alternatives or directions for you to consider in your own practice. You will keep a reflective journal of your weekly experiences in the course and of concepts learned during the week. You should
make an entry into your journal at least once per week and reflect on something that “grabbed” you the most from the readings/ activities/ videos/ scientific inquiry investigations/etc. and you fully intend to use in your class (present or future)!! For your final reflection, you will post a reflection in your journal about Teaching Science.

Follow the themes discussed in class and include critical insight into your emerging understanding of your practice in relation to the themes. Do not simply summarize the content of the class.

**Conference Proposal (25 pts) – [Doctoral Students Only!]**

Doctoral students will be required to prepare a conference proposal for submission to a local, state or national science teachers and/or science education conference. The proposal will include an inquiry-based science lesson that incorporates the state and national standards, TEKS and NGSS, as well as aspects of nature of science. This assignment is DUE – Wed., December 10.

**Name of Assignments:**
All assignments must be named in the following with no spaces between words:
Assignmentname_Firstname.Lastname
Ex: ConferenceProposal_Tonya.Jeffery

**Grading:** EDCI 5390/6390

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points Possible</th>
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<tbody>
<tr>
<td>Attendance &amp; Participation</td>
<td>30</td>
</tr>
<tr>
<td>Readings/Articles/Science in the News</td>
<td>50 5(10)</td>
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<tr>
<td>Personal Analysis Paper</td>
<td>25</td>
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<tr>
<td>Research-Based Project</td>
<td>50</td>
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<tr>
<td>Midterm</td>
<td>100</td>
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<td>Scientific Claims/Issues Investigation</td>
<td>50</td>
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<tr>
<td>Synthesis Paper + Lesson Plan</td>
<td>75</td>
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<tr>
<td>Reflective Journal</td>
<td>20</td>
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<tr>
<td>Conference Proposal</td>
<td>25 ***</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>400 425</td>
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**B. Grading Scale**

Course grades are assigned according to percentage of points earned over points possible.

Grades:
A = 92% - 100%
B = 84% - 91%
C = 76% - 83%
D = 68% - 75%
** Required, no credit given.

*** Doctoral students only! Doctoral students will be required to submit a science teaching conference proposal for this course. Format of proposal ready for submission will be decided by the selected science teachers organization and discussed with students.

IX. Course Schedule and Policies
A. A tentative course schedule and calendar will be provided on the first day of class!
B. Class Policies
   Attendance/tardiness
   Attendance is expected at all classes. There is a high positive correlation between consistent, punctual attendance and higher course grades. It is virtually impossible to receive an A in the course if there are absences and/or lateness. 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 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.

   Extra Credit
   NA

   Make-up Exams
   NA

X. Textbook(s)
Required

Recommended

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/](http://judicialaffairs.tamucc.edu/).

*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](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).
**Cell Phone Usage During Class**

Vigorously discouraged! Cell phone usage is prohibited during class unless special prior permission has been granted by Dr. Jeffery. This includes text messaging, talking, vibrating phones, checking email, responding to email, and/or all other uses to which such devices may be employed. EDCI 5390/6390 is a professional development course in the Department of Curriculum and Instruction at TAMU-CC. You are expected to demonstrate a level of professionalism.

**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.