**CTEE 7430: CURRICULUM & TEACHING IN NATURAL SCIENCE**

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|  | **Instructor:** Dr. L. Octavia Tripp  **Office:** Haley 5016  **Office Hours:** By appointment  **Telephone:** 844-6887  **E-mail:** [eickcha@auburn.edu](mailto:eickcha@auburn.edu)  **Class Time:** Tuesdays 4:00-6:50 p.m.  **Class Location:** Haley 2414    **Credit Hours**: 3 semester hours |  |

**Required Text:**

Krajcik, J. & Czerniak, C. (2007). *Teaching science in elementary and middle school: A project-based approach*. New York: Lawrence Erlbaum Associates **[J&M Bookstore]**

NASA teacher educator guides: Rocketry Educator guide, K-12, Aeronautics Guide, K-4,The Brain in Space, Teachers and Students Investigating Plants in Space, and Exploring the Moon Educator's guide,4-12.

**Required Activities:**

*Estee Rocket Kit fee TBA*

*Field Trip – fee TBA*

**References:**

* Friedl, A. E. & Koontz, T. Y. (2005). Teaching Science to Children: An Inquiry Approach. McGraw-Hill (LRC Reserve)
* American Association for the Advancement of Science (AAAS) (1993). *Benchmarks for science literacy* <http://www.p2061.org/publications/bsl/online/index.php?home=true>
* TEAM-Science Curriculum Guides for state and national standards – <http://teamscience.auburn.edu>
* Alabama Water Watch: <https://aww.auburn.edu/> (pc full access only)
* AU Sustainability Initiative: <http://www.auburn.edu/projects/sustainability/index.php>

**Course Description:**

This course will apply current research and national standards on ‘best practices’ in science education to project-based design of science curriculum. Class meetings will build students’ understanding and ability to do Project Based Science (PBS) through cooperative and hands-on experiences that support construction of the final project-based unit plan. Students will experience components of a project-based science unit – *NASA Teacher Guides* – and how it ties to science literacy on Earth and Space sustainability issues. Students will create a project-based science unit that can be used in the classroom.

**Course Objectives:**

Upon completion of this course, students will be able to:

1. Identify and embrace important national goals of science education and science literacy in the K-8 classroom, including social consequences of science and technology**. 2-4(i), 2-4(ii), 290-3-3-06-1-1, a-1, a-5 a-7, a-14**
2. Articulate a rationale for teaching science through social constructivism and brain-based research on how students learn**. 290-3-3-06 b-3, b-4,**
3. Describe and define a project-based approach to teaching science, including key components, and how it is different from other integrated and thematic approaches**. 290-3-3-06 – b-4, b-6b-8**
4. Meaningfully demonstrate the inquiry process including planning scientific investigations, interpreting data, and supporting student collaboration in PBL units. **290-3-3-06 – b-8, a-14, b-4, a-10, b-9**
5. Apply best practices that support project-based learning in delivery strategies, management, and assessment of students in PBL units. **290-3-3-06-b-9, b-8, a-5**
6. Create a project-based science unit plan for use in the classroom for the new school year. **290-3-3-06-a-7, a-5, a-14, b-4, b-8, b-9**

**Course Assignments and Evaluation:**

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| Required Assignments (100 points):  Chapter Reading discussion postings and Comments **(7 @ 5 pts. ea. – 35 points)**  Coke Cola Field Trip Session Summaries & Handouts **(15 points)**  Project-Based Unit Plan **(Part I: 10 points; Complete: 40 points)**  Self-Evaluation of Class Participation **(10 points)** | Grading Scale:  90-100 points = A  80-89 points = B  75-79 points = C  70-74 points = D  0-69 points = F |

**Assignments:**

All written assignments must be typed and should adhere to Standard English usage and conventions, or they will be subject to point loss and asked to be redone. Assignments must be presented or posted on time. Chapter reading discussion posting and comments will only be given credit if posted on time. All other work will be reduced by one letter grade without prior approval for each day late up to three. **Students must complete all assigned work in order to receive a grade for the course** **– regardless of lateness or point score**.

**Chapter reading discussions** must be posted to Blackboard by Friday night (midnight deadline) – 3 points each. Discussions should meaningfully answer the question(s) **(250-word minimum)** based on the assigned reading, prior practical knowledge and experience, and change in thinking now. At least two ‘comments’ under posted discussion **(75-word minimum)** must be made AFTER the deadline for posting discussion and by Monday night (midnight deadline) before the class meets face-to-face again – 1 point each. Comments should be helpful to the poster and extend thinking and practical help and support for the poster – NOT simply affirm the post. Be sure to make discussion subject lines focus on a major point or idea, and one that will attract others to read it and comment on it! **Look for postings with no comments to consider for your comments!** Be sure to go back and read others’ comments to your posting.

Discussion RUBRIC

Posting

3 points posting = 250-word minimum, multiple references to relevant material from the chapter reading, deep reflection on personal practice based on the reading, impact on personal thinking about teaching science now, possible request for practical help or assistance in changing some aspect of practice

[Credit will be given as 2-points and 1-point for falling below the 3-points standards.]

Comments

1 point comments = 75-word minimum; explicitly addresses bloggers’ thinking, issue(s), or request(s); offers added ideas, thinking, or practical assistance to benefit the blogger

[No credit will be given for comments that fall below the one-point standards.]

**NOTE:** Students should assume that their postings and comments (if done and on time) have received full credit unless they hear from the instructor by email stating otherwise.

**Field trip** (Coke Cola Science Center) **summaries** **and documents (3)** will be required from your visit to the center, (5 points each). Students will complete a one-page summary of your visit. Summaries or documents should review what you learned from a session or tour, about (1 point), what was meaningful or practical tips or materials gained (1 point), and how the session will impact teacher’s practice (1 point). Photocopies of any handouts from the center should be attached to each summary (2 points).

The **PBL unit** (as final exam) will be graded in two parts at two different times in the term. Comments and notes made on the first smaller part should be used to make changes to the final project due at end-term. See attached rubric and details. Students will present their PBL Unit during the last class meeting.

The **Self-evaluation of participation** and learning in the class will be completed during the last class meeting. Students should be mindful of these expectations throughout the course. See attached form.

**Course Content and Schedule:**

LAYING THE FOUNDATION \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Week 1 8/24 Introductions, Course Overview and Program Check-sheet

 Read Chapter 1 for discussion next class meeting.

Respond to the following questions:

How can we make science meaningful to learners?

What does it mean to know science?

How can we assess and understand what learners know?

What kind of ***doing*** science is involved in learning science?

How can we support learners as they do science?

Week 2 8/31 Teaching Science to Children – Chapter 1

* Read and complete blog and comments for chapter 1*-- (bullets are homework)*

Week 3 9/7 How Students Construct Understanding of Science – Chapter 2

* Read and complete blog and comments for chapter 2

Week 4 9/14 Establishing Relevance to Students’ Lives – Driving Questions – Chapter 3

* Read and complete blog and comments for chapter 3

Week 5 9/21 Sustaining a Culture of Inquiry in Teacher Education

How does Geckos stick?

NASA’s The Brain in Space Guide for Teachers

Week 6 9/28 Developing Scientific Investigations – Chapter 4

*NASA Aeronautic Guide for Teachers*

* Read and complete blog and comments for chapter 4
* Field trip discussion for 10/12. Follow directions, information, and dress accordingly.

Week 7 10/5 A day in the life of John Henry, A Traffic Cop; <http://www.udel.edu/pbl/curric/acc12.html>

Week 8 10/12 [**4:00-7:50 p.m.** **Field Trip: Coke Cola Science Center Columbus GA**] Collaboration in the Science Classroom – Chapter 7

* Read and complete blog and comments for chapter 7 – COMPLETE BY 10/19
* Review PBL unit and components in syllabus – See chapter 12 as reference
* **PBL UNIT – NUMBERS 1-3 – DUE WEEK 12**

Week 9 10/19 Teachers and Students Investigating Plants in Space

Week 10 10/26 NASA Rocketry Teacher Workshop – Making Estee Rockets

APPLYING RELEVANT STRATEGIES \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Week 11 11/2 Rocket Launch and reflections

Week 12 11/9 Making Sense of Data and Sharing Findings – Chapter 5

Using Learning Technologies to Support Students in Inquiry – Chapter 6

* Read and complete one blog and comments for chapters 5 and 6

Week 13 11/16 30 Instructional Strategies that Support Inquiry – Chapter 8 **[Computers]**

* Read and complete blog and comments for chapter 8
* **Completed PBL UNIT – NUMBERS 4-8 (1-3 revision) – DUE NEXT CLASS MEETING**

Week 14 11/23 Thanksgiving Break

Week 15 11/30 Presentations and Social: PBS Units and/or Research Proposals

* Complete Self-Evaluation of Participation form
* Read chapter 13 – Next steps

**NOTE:** We did not address the chapters on assessment or classroom management. However, you are strongly encouraged to review these chapters. Teachers who are new to using collaborative, inquiry-based approaches to teaching science will benefit greatly by reading these chapters.

**Class Policy Statements**:

Participation: Students are expected to participate in all class discussions and participate in all exercises. It is the student’s responsibility to contact the instructor if assignment deadlines are not met. Students are responsible for initiating arrangements for missed work.

Attendance/Absences: Attendance is required at each class meeting. If a class is missed, late work will be accepted without penalty only for university-approved excuses as outlined in the Tiger Cub. Excuse notes must be turned into the instructor no more than seven days after the absence, or it is unexcused. Excessive absences (3 or more) regardless of excuse will lead to a referral to the Office of Student Affairs to be withdrawn from the course. The instructor should be notified by email of any absence prior to the class meeting, or as soon as possible. **Other professional absences from class must be documented and approved by the instructor in advance. No more than 1 professional absence is permitted.**

The final grade will be deducted by a letter grade for each unexcused absence from class. **At 2 unexcused absences students will be referred to the Office of Student Affairs to be withdrawn from the course.** Three unexcused tardies to class will be counted as one unexcused absence. Leaving class early counts as a tardy.

Unannounced quizzes: There will be no unannounced quizzes.

Accommodations: Students who need accommodations are asked to arrange a meeting during office hours the first week of classes, or as soon as possible if accommodations are needed immediately. If you have a conflict with my office hours, an alternative time can be arranged. To set up this meeting, please contact me by e-mail. Bring a copy of your Accommodation Memo and an Instructor Verification Form to the meeting. If you do not have an Accommodation Memo but need accommodations, make an appointment with the Program for Students with Disabilities at 1244 Haley Center, 844-2096 (V/TT).

Honesty Code: The University Academic Honesty Code and the Tiger Cub Rules and Regulations pertaining to Cheating will apply to this class.

Professionalism: As faculty, staff, and students interact in professional settings, they are expected to demonstrate professional behaviors as defined in the College’s conceptual framework. These professional commitments or dispositions are listed below:

* Engage in responsible and ethical professional practices
* Contribute to collaborative learning communities
* Demonstrate a commitment to diversity
* Model and nurture intellectual vitality

Cell Phones: Students are expected to turn cell phones off or to vibrate during class and lab time.

**Project-Based Learning Unit Requirements (40 points) – Follow chapter 12 of text**

Directions: Develop each given area below for your project-based unit and grade level. Submit your project in a ½ inch, three-ring binder with the seven sections tabbed. A project-based unit can be short or long, but for our course should be one to two weeks of 45-minute periods. Consider the use of *GEMS Guides* and other investigative curricula in your unit. You MUST use multiple sources for lessons or materials in your unit – to make it ‘your’ work. Use the **TEAM-Science Curriculum Guides** on the web for links to state and national standards (AAAS, 1993; NRC, 1996): <http://teamscience.auburn.edu/>.

1. Cover sheet (required) – Name, date, grade level, project driving question, duration of unit, related sketch/image
2. Student learning performances (objectives) **(6 points)**
   * Consult the TEAM-Science curriculum guides for the grade level science standards (state and national) that apply to your chosen topic.
   * Develop learning performances or objectives in each of the four knowledge domains, considering higher levels of cognitive functioning, from your applicable standard(s).
   * Create a table similar to Table 12.1 on page 435 for your generated learning performances and place your chosen state and national standard(s) before it.
3. Driving question **(4 points)**
   * Suggestion: See Learning Activity 12.2 on page 452.
   * Write out your driving question and your rationale for selecting it.
4. Lesson plans including[[1]](#footnote-1): **(12 points)**
   * student learning performances (or learning objectives) – applicable ones from #2 table above.
   * **relationship of lesson to the driving question** (How does its sub-question help answer it?)
   * materials (and any special needed print material for lesson parts or assignments)
   * instructional strategies[[2]](#footnote-2)
   * time required
   * cautions
   * instructional sequence – introduction, representing the content, establishing links to the driving question
   * assessment – description of the assessment embedded in the lesson for evaluating student learning
5. Assessments **(8 points)**

* Create varied and embedded assessments that are appropriate for measuring student learning performances (objectives); Assessments must be complete and with scoring rubrics, check-lists, etc.
* Revisit your learning performance table and add the assessment performance that matches it (See Table 9.1)

1. Calendar of activities **(4 points)**

* See Table 12.5 example on page 458 before creating your own calendar of activities. Entitle each day with your **sub-question** (or inquiry question) that the lesson addresses. Also, list your **embedded assessment**.

1. Resources **(4 points)**

* Select and evaluate (See Table 12.6 and 12.7) major resources not readily available to all teachers
* Create a resource list with contact-purchase information (e.g., community contacts, GEMS guide, FOSS kit)

1. Integration of curriculum **(2 points)** [NOTE: Not a separate section of your unit plan]

* Review your unit for other disciplinary standards that you meet: Grades 5-6 see Table 12.11; Grades K-4 see state standards for your grade level.
* Add these standards under their appropriate discipline heading (math, etc.) to #2 above.

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Project-Based Learning Unit Scoring Rubric (40 points)

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| --- | --- |
| RUBRIC  2.0 points = completely meets requirement  1.5 points = mostly meets requirement  1.0 point = sometimes meets requirement  0.5 point = rarely meets requirement  0.0 point = does not meet requirement | NOTE KEY LESSON REQUIREMENTS  +At least one detailed Scientific Investigation as defined in this  course is required or the PBL Unit will be incomplete.  +Multiple sources (more than one) for lesson plans are required.  +At least one community resource is required. |

1. Cover sheet complete: \_\_\_\_\_\_\_ **(required check)**
2. Student learning performances **(6/\*2 points)**
3. All science Standards (State and National) that apply are listed: \_\_\_\_\_
4. \*All non-science standards (State and/or National) that apply are listed: \_\_\_\_\_
5. Learning performances in a table in all knowledge *domains* and *dimensions*: \_\_\_\_\_
6. Learning performances are congruent with listed Standards: \_\_\_\_\_
7. Driving question **(4 points)**
   1. The driving question meets the 6 criteria for a good question: \_\_\_\_\_
   2. Learning performances directly address the Driving Question: \_\_\_\_\_
8. Lesson plans **(12 points)**
   1. Opening and closing activities address the Driving Question: \_\_\_\_\_ **(required check)**
   2. Lesson-to-lesson sequence (multiple sources) is coherent & conceptually strong: \_\_\_\_
   3. Lesson content and process matches student learning performances: \_\_\_\_\_
   4. Lesson sub-questions or outcomes help answer the driving question: \_\_\_\_\_
   5. Scientific Investigation *(clearly identified)* includes all appropriate sections: \_\_\_\_\_
   6. *Instructional sequence* of lessons are ‘teacher-ready’ to follow and use: \_\_\_\_\_
   7. Each lesson includes all completed 8 sections outlined in the assignment: \_\_\_\_\_
9. Assessments **(8 points)**
   1. Assessments are *authentic*, meaningful, multiple, and varied: \_\_\_\_\_
   2. Assessments are *embedded* in instruction: \_\_\_\_\_
   3. Assessments are congruent with learning performances (and listed in Table): \_\_\_\_\_
   4. Assessments have rubrics/checklists for scoring, where appropriate: \_\_\_\_\_
10. Calendar of Activities **(4 points)**
    1. Calendar lists each day of unit instruction & activity description in table format: \_\_\_\_\_
    2. Calendar days list sub-question as header and embedded assessment piece: \_\_\_\_\_
11. Resources **(4 points)**
    1. All major resources that are not readily available to the teacher are listed: \_\_\_\_\_
    2. Resources include contact, location, source, and/or purchasing information: \_\_\_\_\_
12. (Integrated into #2b above).

TOTAL SCORE: \_\_\_\_\_\_\_\_ (out of 40 points)

Name Date

**CTEE 7430: Self-Evaluation of Participation Check-Sheet (10 points)**

*A Metacognitive Learning Tool*

Directions: Rate yourself on each of the given indicators of *dispositions* and *performance* in this course based on evidence. **If your instructor differs with any of your ratings, he can change them but must first inform you to discuss it.** Do not give yourself an excellent rating on any indicator without first noting ample evidence supporting it.

Rating Score

2.0 = Excellent, 1.5 = Good, 1.0 = Fair, 0.5 = Poor, 0= Inexcusable

|  |  |
| --- | --- |
| Indicator | Score |
| 1. Commitment to class (including attendance & tardiness) and putting new learning into practice  If excellent … |  |
| 2. Timeliness, completion, and quality of assigned homework, projects, and tasks  If excellent … |  |
| 3. Frequent, important, and helpful oral or vocal contributions to class discussions  If excellent … |  |
| 4. Positive attitude and effort towards class, in-class tasks, and working with peers  If excellent … |  |
| 5. Demonstrated leadership through course contributions, suggested changes, taking on additional tasks, and desire to see meaningful class learning at high levels  If excellent … |  |

Additional Comments on Personal Growth and Learning from this course. **[Respond on back]**

1. Most curricula will include activities written like lesson plans that address most of these bullets. Attach a copy of the activity itself and only add the missing bullets of information. Also, attach any needed print materials for lesson parts or assignments. **Note: You must have an opening and culminating activity that address your Driving Question.** [↑](#footnote-ref-1)
2. Consider varied instructional strategies from each category: Direct, indirect, experiential, independent. You MUST include at least one scientific investigation (inquiry question, data gathering, data analysis, conclusion, and sharing), a community resource, children’s literature, and use of technology – ALL OF THESE ITEMS ARE REQUIRED. [↑](#footnote-ref-2)