COMPUTERS IN SCIENCE EDUCATION
EDTE 671

Course Information
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Class meeting times: Tuesdays and Thursdays, 10:30 – 12:45
Office hours: Tuesday and Thursdays 9:30-10:30 or by appointment

Course Objectives and Organization
In Computers in Science Education, we will build on current research and practice to better prepare you to foster science learning through the integration of computer technologies. EDTE 671 will actively engage you in teaching and learning activities, much in the way we hope you will actively engage your students. Classroom discussions will focus on the strategies for the integration of computer technologies and how these strategies relate to students, teachers and curriculum standards. You will apply your growing understanding of science teaching by developing, enacting, and refining science curricula. One emphasis of this course will be on the idea of preparing to teach and analytically reflecting on your own and others' teaching. Thus, developing and teaching lesson "plans" will be only a part of what you'll do for these enactment activities.

This course will help prepare you for your A and B internships and your secondary science certification. You should be aware that failure to meet any one of the following requirements will result in a grade of F in one or more final (student teaching) internship courses:

- Participation for 12 weeks or 60 full days in the internship
- Teaching independently for a minimum of 10 full days in one placement/setting
- Assessed as “Competent” through ADEPT
During this course, you will:

• become familiar with current technologies, including: 1) simulations, 2) data collection and organization, 3) modeling and visualization, 4) web-based curricula and 5) presentation software.

• prepare to carry on inquiry-oriented activities that integrate the use of learning technologies

• gain experience in preparing, teaching, and analytically reflecting on middle and secondary school science lessons that utilize learning technologies.

• develop long-range teaching skills by preparing an in-depth science curriculum project.

EDTE 671 will be organized around the driving question:

**How can I integrate learning technologies to support student understanding in middle and high school environments?**

This driving question is addressed by focusing upon a series of four projects

• Integration of visualizations and modeling tools

• Integration of web-based learning environments

• Evaluation and integration of commercial software

• Integration of real-time data collection

**Course Reading Material and other supplies**

*National Science Education Standards* are "the" standards for science teaching; though many states have their own standards or frameworks, they are generally in line with the NSES. They are available on-line at [http://books.nap.edu/html/nses/html/index.html](http://books.nap.edu/html/nses/html/index.html)

South Carolina Curriculum Standards


They are available on-line at [http://project2061.aaas.org/tools/benchol/bolintro.html](http://project2061.aaas.org/tools/benchol/bolintro.html)

Blank tape for video documentation of enactments (digital video-miniDV)

Blank data storage (disk and read/write CD)

**Readings Packet: EDTE 671**

Can be picked up at Universal Copies

Various Journal articles as assigned
Course Requirements and Grading

Note: Since this course is intended to help you become the best teacher you can be, it will be graded with a mastery perspective. The percentages listed here are approximate, but will give you a sense of the relative weight of each assignment. Expectations for these assignments will be discussed in more detail in class.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Due Dates</th>
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<tbody>
<tr>
<td>Class participation and attendance</td>
<td></td>
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<tr>
<td>Discussion Board Postings</td>
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<tr>
<td>10%</td>
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<tr>
<td>15% 1. Smartboard/CPS Lesson Plan</td>
<td>June 11</td>
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<tr>
<td>15% 2. Probe-ware lesson plan</td>
<td>June 25</td>
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<tr>
<td>15% 3. One web-based technology (or Web site)</td>
<td>July 02</td>
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<tr>
<td>15% 4. Web quest lesson plan</td>
<td>July 09</td>
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<tr>
<td>15% 5. Reflection paper (July enactments)</td>
<td>July Reflection due July 30th</td>
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<tr>
<td>Reflections should include:</td>
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<tr>
<td>a) Affordances and limitations of the software (student perspective)</td>
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<tr>
<td>b) Affordances and limitations of the software (teacher perspective)</td>
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<td>15% 6. Critical Reflection/Portfolio Entries</td>
<td>August 5th</td>
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<td>Construction of 1 critical reflection video</td>
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<td>during July project.</td>
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Grades will be based upon the following scale:

- **A:** 92 – 100
- **B+:** 91 – 88
- **B:** 87 – 82
- **C:** 77 – 72
- **D:** 71 – 65
- **F:** 64 and below
- **C+:** 81 – 78

Tentative Course Schedule

This schedule may change as the course progresses! Furthermore, homework assignments may be assigned in class, in addition to the reading assignments listed here.
WEEK #1: Interactive Technologies
- Smart Board
- Syllabus review
- CPS and Interwrite
  - Interactive Technology lesson due June 11

WEEK #2: Technology for Reflection and Context (June 9)
- What is this class all about?
  - Overview of course – no reading assignment
  - Overview on Electronic Portfolio
  - Intro to Digital Video production
- What is the purpose of digital video?
  - Video for reflection
  - Anchored instruction
  - Intro to video import and editing with Imovie or Movie maker

WEEK #2: Technology for real time data collection (June 9, 11, and 16)
- Probe-ware
  - What comes first?
  - Examples by grade level
    - Present Probe lesson June 19
    - Formation of HS enactment teams, selection of topic.

WEEKS #3 & 4: Seamless integration of technology (June 18, June 23)
- Topic introduction and checking for understanding
  - Visualizations and modeling (Netlogo, BioLogica, Molecular Workbench, WISE)
  - Web-based technology lesson

WEEK #4: Webquests
- Purpose and construction

WEEK #5: Middle School Project-based Science Units/Inspiration
- Introduction to PBS units (June 30)
- Concept mapping as a scaffold for learning or assessment

WEEK #6: Curriculum planning for practice teaching/summer institute
- Workday (07 July)
- Materials Prep (09 July)

WEEKS #7 & #8 Practice, Practice, Practice. (Weeks of July 13, July 20)
- Working with high school students at USC
  - Enactment of technology rich curriculum projects

WEEK #9
- Reflection on Teaching Unit (05 August)
  - Using composer to build your electronic portfolio
  - What goes in the portfolio?
WEEK #10: Final Presentations (05 August)

- July Reflection Due July 31st
- Final Project and Presentation due August 5th

Projects:

#1 Interactive Technology Lesson: Construct a lesson using one of the interactive technologies introduced during week 1. May use one or multiple technologies. The lesson plan(s) will be assessed based upon the following rubric. Analytical rubric posted on BlackBoard. You should follow the lesson plan format provided in EDSE 553.

1. Rationale:
   - 1 – 2 paragraphs describing why the video was selected for use with the identified standard. The paragraph should include how video may be re-visited in future lessons in order to provide a meaningful context for an entire unit.

2. Organization
   - Lesson plan is clearly organized and demonstrates a well thought out pattern of steps that illustrates how the lesson should “unfold” during the class.
   - Lesson plan includes an easily identifiable goal (purpose)
   - The Lesson plan includes “steps” that are indicative of an inquiry-based approach, includes opportunities for students to make connections between the technology, the standard, and provides opportunities for the teacher to assess student understanding.

3. Scaffolds
   - Lesson plan recognizes potential trouble areas and provides supports to alleviate the potential problems. These supports may include the use of specific open-ended questions or prompts to guide the learner in a specific direction.

#2 Probeware Lesson: Select probeware (with approval, selection is NOT limited to those discussed in class) and design a brief lesson plan that utilizes the probeware to both integrate the technology and to provide context for learning of a key scientific standard (use SC science standards). Lesson plans that only contain a “how to” procedure will not be accepted. The lesson plans need to integrate the website/software within an appropriate science classroom context.

The lesson plan(s) will be assessed based upon the following rubric

1. Rationale:
   - 1 – 2 paragraphs describing how the probeware use strengthens understandings of the identified standard. The paragraph should include how this experience may be re-visited in future lessons in order to provide a meaningful context for an entire unit.

1. Organization
   - Lesson plan is clearly organized and demonstrates a well thought out pattern of steps that illustrates how the lesson should “unfold” during the class.
   - Lesson plan includes an easily identifiable goal (purpose)
   - The Lesson plan includes “steps” that are indicative of an inquiry-based approach, includes opportunities for students to make connections between the video, the standard, and provides opportunities for the teacher to assess student understanding.
2. Scaffolds
   • Lesson plan recognizes potential trouble areas and provides supports to alleviate the potential problems. These supports may include the use of specific open-ended questions or prompts to guide the learner in a specific direction.

#3 Web-based Technology Lesson: Select a web site (or a piece of software not discussed in class) and construct a lesson plan that integrates the technology. The lesson plans need to integrate the website/software within an appropriate science classroom context. Lesson plans that only contain a “how to” procedure will not be accepted.

The lesson plan(s) will be assessed based upon the following rubric
1. Context is established
   • Lesson plan establishes an environment that is based upon facilitating students in the understanding of concepts or processes associated with the SC curriculum standards.
2. Scaffolds (Your design may necessitate a student handout for clarity of procedures or learning.)
   • Lesson plan recognizes potential trouble areas of the technology and provides scaffolds to alleviate the potential impedance that they may cause the learner. The lesson plan maximizes the supports inherent to the software to facilitate student learning.
3. Rationale
   • The lesson plan provides a clear rationale for why the technology is being utilized.
4. Assessment
   • The lesson plan includes a strategy to determine if learners understand the function and rationale for engaging in the technology. (e.g., Do they know what they are doing?)
5. Technology Introduction
   Lesson plan introduces the technology in a manner that is logical and provides a natural transition to the learner.

#4 Webquest Lesson: Select a web site and construct a brief lesson plan that utilizes a webquest to both integrate technology and to provide context for learning of a key scientific standard (use SC science standards).
The lesson plans need to describe the setting for its integration within an appropriate science classroom context. Lesson plans that only contain a “how to” procedure will not be accepted.

The lesson plan(s) will be assessed based upon the following rubric
1. Rationale 1–2 paragraphs describing how the webquest use strengthens understandings of the identified standard. The paragraph should include how this experience may be re-visited in future lessons in order to provide a meaningful context for an entire unit. An introduction that sets the stage and provides some background information.
2. Organization
   • Lesson plan is clearly organized and demonstrates a well thought out pattern of steps that illustrates how the lesson should “unfold” during the class.
   • Structure is most likely to be paired or group activities and although interdisciplinary in nature, descriptively focused on just science discipline.
3. Contain:
A. A task that is doable and interesting and a set of information sources needed to complete the task. Many (though not necessarily all) of the resources are embedded in the WebQuest document itself as anchors pointing to information on the World Wide Web. Because pointers to resources are included, the learner is not left to wander through webspace completely adrift.

B. Process description that learners should go through in accomplishing the task. The process should be broken out into clearly described steps.

C. Guidance (guiding questions, or directions to complete organizational frameworks such as timelines, concept maps, or cause-and-effect diagrams) on how to organize the information acquired.

D. Conclusion that brings closure to the quest, reminds the learners about what they've learned, and perhaps encourages them to extend the experience into other domains.

- Lesson plan includes an easily identifiable goal (purpose)
- The Lesson plan includes “steps” that are indicative of an inquiry-based approach, includes opportunities for students to make connections between the video, the standard, and provides opportunities for the teacher to assess student understanding.

4. Scaffolds
- Lesson plan recognizes potential trouble areas and provides supports to alleviate the potential problems. These supports may include the use of specific open-ended questions or prompts to guide the learner in a specific direction.

#5 REFLECTION PAPER
Focusing on the role that the technologies played during the July enactments provide a 2-3 page reflection on the level of success the technology had on 3 of 5 following curricular components:
1) meaningful context,
2) inquiry,
3) collaboration,
4) conceptual understanding
5) assessment
For each of these components include an evidence-based description of the “positive” aspects and “missed opportunities.”

#6. CRITICAL REFLECTION/ PORTFOLIO ENTRIES
During the July enactment each student must construct a digital video clips highlighting a series of “missed opportunities” and “shining moments.” At least one clip needs to highlight a technology that was used during the enactment. The entry should include short clips (no longer than 45 seconds) that capture critical components of the lesson and that provide a “jumping off point” for a rich class discussion. The discussion should include how they would change their instruction if they would teach the unit again.
This is to be used as a portion of the fall digital portfolio project.