TEACHER EDUCATION INSTITUTE

Bringing Excitement to the Science Classroom

Course Outline

Course Description

Science is a dynamic, exciting field that covers areas from leaf identification to quantum physics. Students are often drawn to it because of their natural curiosity and the diverse areas of study that can spark their own varied interests. Science is a natural question initiator; "Why is the sky blue" and "what kind of food do mealworms prefer" are questions any level of student might ask, and the level of answer will vary with the age and experience of the student. These questions are actually an excellent starting point for approaching the National Science Education Standards, which all too often are overlooked as "rules", "state mandated requirements", or "stuff we have to teach for the test".

In actuality, the Science Standards are an excellent framework for what we SHOULD cover in a given grade level and how it COULD be done. It does not approach science from a "fact based" approach but instead emphasizes the following ideas:

- Science is for ALL students.
- Learning science is an ACTIVE process, not passive.
- School science reflects the intellectual and cultural traditions that characterize the PRACTICE of contemporary science.
- IMPROVING science education is part of systemic education reform.

(National Science Education Standards, NRC)

In this course, we will be seeking ways to do Number 4. But the underlying trend is to not only cover the Science Standards but also to motivate, inspire, and drive our students to love or at least appreciate science and its workings. Often times, the stress and need to prepare for the pass the information along pushes teachers to cover material in a traditional method, and the wonder and excitement of science is lost to time spent on covering "the curriculum", or "stuff on the test". There is an innate tendency for children of all age levels to discover and explore how nature works. This does not have to be hindered or lost because of the need to teach to "the standards".

Though this course will be directed at presenting science-oriented strategies, teachers of any subject area will benefit from the activities, discussions, and motivators presented in this class. Some of these strategies will directly aid in the teaching of math and technology. With some "tweeking", these strategies can also be used in English, Social Studies, and Language Arts subjects as well.

The aim of this course is to infuse within its students the thrill and excitement of science. By looking at what teachers already do, and either adding or adjusting what they do, science in the classroom can be enhanced or even revitalized. Science education develops the skills not only for future doctors, scientists, and engineers, but also for future citizens who will have to make decisions on many new science advances that will affect their own lives.

This course has several main objectives. First, it will explore what it means to "do science". Second, we will investigate what skills students should be learning to aid them in doing science. Third, we will examine the National Science Education Standards and evaluate their use in creating labs, demos, and activities. Fourth, we will critique and develop activities with an emphasis on bringing "excitement" to the science classroom. And finally, we will assess the myriad laboratory and paper activities, media, and other resources available to improve how our students see and do science.

Objectives

- Describe the nature of science
- Identify the questions and concepts that guide scientific investigations
- Describe the scientific method and its elements as part of "the process of science"
- Compare traditional classroom settings to a constructivist setting
- Apply the theory of multiple intelligences to a specific level of science curricula
- Explain how the Essentials of Teaching affects overall classroom performance
- Create a list of basic skills needed to effectively learn science at all grade levels
- Chart the National Standards for Elementary, Middle, and High School Science
- Explain the meaning of the phrase, "science as inquiry"
- Distinguish between "canned" labs and "inquiry-based" labs.
- Create an inquiry based lab that is grade appropriate
- Assess the value of inquiry based labs over "canned" labs
- Model the use of formative assessments in the classroom
- Summarize the "motivator" for students in education in general and science in particular
- Incorporate two motivators into your final integration project
- Examine the various types of professional, popular, fiction, and non-fiction literature available and determine how they may be used in science lessons
- Evaluate the various types of audiovisual media available to science
- Discuss the value of play in science class, including the impact of role plays, games, and songs on student learning
- Evaluate age appropriate literature that is science themed
- Design a lesson appropriate for your grade level

Curriculum Design & Time Requirements

Bringing Excitement to the Science Classroom is a three credit graduate level course or forty-five professional development hours taught on weekends or over five full days. The following methodologies are used during the course: lectures, readings, group discussions, and assignments. In addition, hands-on lab activities, pen and paper activities, role-plays, and multimedia presentations will allow students to develop their own classroom materials.

Course Materials

The text being used for this course is *Formative Assessment for 3D Science Learning: Supporting Ambitious and Equitable Instruction* by, Erin Marie Furtak. Activities and readings will be referenced from this text throughout the course. In addition to the course text, students may receive supplemental material.

Session Outline

Session 1: Science as a Process
Contents:

1. An Introduction to the course
2. The 3 R's of TEI - Rules, Regulations, Registration
3. Instructor and group introductions
4. The scientific method and its elements as part of "the process of science"
5. Inquiry-base science
6. Assignment

Session 2: Science Standards at Every Level
Contents:

1. The National Standards for Elementary Science Education
2. The National Standards for Middle School Science Education
3. National Standards for High School Science Education
4. Tying it all together; the Next Generation Science Standards
5. Basic skills needed at each level
6. FACTS or Formative Assessment Classroom Techniques

Session 3: Introducing FACTS
Contents:

1. The multi intelligent science student
2. The "Essentials" of teaching (especially science!)
3. Classroom environments that support the use of Formative Assessment

Session 4: Using Inquiry Based Laboratory Exercises to Enhance Science Retention
Contents:

1. Labs - the best of all manipulatives
2. Inquiry based labs - increasing student involvement and problem solving abilities
3. "Canned" labs vs "inquiry-based" labs
4. Demonstrations - the "safe" form of lab exercises

Session 5: Demos and Models and Science Fairs – another way to teach ideas
Contents:

1. Modeling - making science more individual
2. Dioramas - not just for Social Studies
3. The positive and negatives of the he Science Fair

Session 6: Another type of fun in Science – Role-plays, Games, and Songs

1. The use of role-plays in the classroom
2. Examples of role-plays in the science classroom setting

3. Games and simulations - helping students learn science concepts
4. Science songs - singing all the way to an "A"

Session 7: Reading and Writing in Science
Contents:

1. Writing and science - mutually exclusive, right or wrong?
2. Distinguish between technical writing and literary writing
3. Professional science literature vs popular science literature
4. The use of science fiction in the science classroom
5. Science readings with a purpose
6. The science journal or notebook - catching two birds with one net

Session 8: Multimedia and Science
Contents:

1. An introduction to multimedia in the science classroom
2. Videos and other audiovisual media
3. Bill Nye the Science Guy - help or hindrance? Looking at Bill from a Whole Brain Learning perspective
4. You Teach and other websites
5. Computer programs

Session 9: Science and Technology
Contents:

1. Thomas Edison - "To invent, you need a good imagination and a pile of junk"
2. The relationship between science and technology
3. The "scientific citizen"
4. Creating technology projects for the science classroom

Session 10: Final Presentations
Contents:

1. Presentations of Group Projects
2. Evaluations
3. Final Exam

Grading

Assignment	**Points**	**Grading Scale**	
Group and Classroom Participation	30	104 – 96	**A**
Assignments	25	95-88	**B**
Mini Projects (3x)	15	87 – 80	**C**
Final Integration Project	15		
Final Exam	15		
Total Points	**104**		

Student Requirements

1. Attend all class sessions for the requisite number of hours (45) and actively participate in all class activities.
2. Complete all reading assignments in the textbook, Web sites, and research articles.

3. Completion of three (3x) mini projects - one mini-project may be part of the Final Integration Project, but must follow all criteria of both the Mini Projects requirements and the Final Integration Project.
4. The final project should consist of a lesson that truly shows exciting, innovative, and relevant strategies and techniques in teaching a science lesson of your choice. The lesson must include your teaching objectives and a description of activities and content, including handouts.
5. Pass a final exam.

Student Academic Integrity

Participants guarantee that all academic class work is original. Any academic dishonesty or plagiarism (to take ideas, writings, etc. from another and offer them as one's own), is a violation of student academic behavior standards as outlined by our partnering colleges and universities and is subject to academic disciplinary action.