Module 8: Science Education: Using Inquiry to Teach Science

If you do not have SKYPE on your computer, go to: http://www.skype.com and download the software. You will need it to complete Module 9. You also will need a microphone for your computer. A headset with microphone is often a good idea.

Please Note: Module 8 establishes the concepts you will be applying in Module 9. These two Modules work together to provide you the strategies for raising the levels of thinking and classroom productivity with a specific emphasis on the teaching of inquiry through science. You should read through both Modules carefully before beginning work on Module 8 activities.

TPE 8: Learning About Students
Salient features are: drawing upon an understanding of patterns of child and adolescent development to understand their students.

Participants will learn about inquiry and how to use it to teach science concepts.

Teaching Performance Expectations
Focus: Learning About Students (8)
Sub-Focus:
TPE 8: Learning About Students

Candidates for a Teaching Credential draw upon an understanding of patterns of child and adolescent development to understand their students.

TPE 8 BENCHMARKS

- Using formal and informal methods, candidates assess students' prior mastery of academic language abilities, content knowledge, and skills, and maximize learning opportunities for all students.
- Through interpersonal interactions, candidates learn about students' abilities, ideas, interests and aspirations.
- Candidates encourage parents to become involved and support their efforts to improve student learning.
- Candidates understand how multiple factors, including gender and health, can influence students' behavior, and understand the connections between students' health and their ability to learn.
- Based on assessment data, classroom observation, reflection and consultation, candidates identify students needing specialized instruction, including students whose physical disabilities, learning disabilities, or health status require instructional adaptations, and students who are gifted.

<table>
<thead>
<tr>
<th>Level 1: Minimal</th>
<th>Level 2: Beginning</th>
<th>Level 3: Proficient</th>
<th>Level 4: Exemplary</th>
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<tbody>
<tr>
<td>The teacher candidate provides little or no evidence of the benchmarks specified for TPE 8.</td>
<td>The teacher candidate provides some evidence of the benchmarks specified for TPE 8.</td>
<td>The teacher candidate provides substantial evidence of the benchmarks specified for TPE 8.</td>
<td>The teacher candidate provides clear, consistent, and convincing evidence of the benchmarks specified for TPE 8.</td>
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Activity 8.01

Introduction to Science Education

Science education is often overlooked in the elementary classroom to make time for increased emphasis on language arts and mathematics. In this activity you will be introduced to the California Science Standards and some useful links to providing hands-on experiences for students from kindergarten through grade six.

Participants will explore online resources for science education and critically review one website.

Participants will submit proof of permission to videotape in the classroom.

Resources

Annenberg Case Studies (http://www.learner.org)
- Journey North Project
(http://www.learner.org/jnorth)

NASA: National Aeronautics and Space Administration (http://www.nasa.gov)
(http://www.nasa.gov/)

Kids Astronomy (http://www.kidsastronomy.com)
(http://www.kidsastronomy.com/)

Enchanted Learning (http://www.enchantedlearning.com)
- Astronomy
(http://www.enchantedlearning.com/subjects/astronomy)

Geology for Kids (http://www.kidsgeo.com)
(http://www.kidsgeo.com/)

Biology for Kids (http://www.kidsbiology.com)
(http://www.kidsbiology.com/)

Environmental Protection Agency (http://www.epa.gov)
- Environmental Kids Club
(http://www.epa.gov/kids)

Jason Project (http://www.jason.org)
(http://www.jason.org/)

Archimedes Laboratory (http://www.archimedes-lab.org)
- Optical Illusion Activity Index
(http://www.archimedes-lab.org/index.optical.html)

GIS Population Data (http://www.esri.com)
(http://www.esri.com/)

The Planetary Society (http://planetary.org)
- Red Rover Goes to Mars
(http://planetary.org/rrgtm)
EDC Center for Science Education (http://cse.edc.org)
- Web-Based Chemistry Simulations
  (http://cse.edc.org/products/simulations/default.asp)

Exploratorium (http://www.exploratorium.org)
  (http://www.exploratorium.org/)

Procedure

1. Begin by viewing the PowerPoint slide show with information on science education in Appendix 8.01a.

2. It is now time to select and visit a leading online science resource from the sites listed above. View Appendix 8.01b for an annotated list of these websites.

3. While you are encouraged to look at all of the listed sites, please select only one to review. As you review your site, look for two activities that could come out of using the website in your classroom.

   Next go to your response form (Professional Reflection 9) and complete a critique.

4. Throughout the CalStateTEACH Program, you are asked to reflect on your classroom teaching by videotaping yourself implementing a lesson plan. Reflecting on your teaching practice by reviewing these videos will also help prepare you to successfully complete the CalTPA tasks. You will upload proof of permission to videotape in the classroom to your My Work folio at the beginning of this and each subsequent Term.

   Some school sites collect permission for classroom photography and videotaping at the beginning of the school year, while other placements may require you to obtain caregiver signatures for each student you are working with. Speak with your school site mentor to find out the specific requirements at your school site. **Note: If at all possible at your school site, please use the Video Permission District form.**

5. Click on the TPA Center link in the left-hand menu bar and read the Video Permission Guidance document. Next download either the Video Permission District form or the Individual Permission form. Obtain the required signatures. Read the Scanning Guidelines document under the TPA Center link. Scan your signed permission form(s) to create a single electronic document and save the document as lastname_firstname_VideoPermission_2. Upload the electronic document directly to your My Work folder as an attachment.

   - Proof of permission to videotape in the classroom

Appendices for Activity 8.01
- Appendix 8.01a Science in Education Powerpoint
- Appendix 8.01b Annotated List of Online Science Resources

All appendices are available for download from the CalStateTEACH Course Website.
Activity 8.02

Learning About Inquiry

In this activity you will view inquiry teaching in a classroom to guide the development of inquiry lesson plans in Module 9.

Participants will view exemplary inquiry teaching in an elementary classroom for application in future lesson planning.

Resources

Annenberg Case Studies (http://www.learner.org)
• Interactive Resources by Content Area (http://www.learner.org/)
• Workshop 2 Setting the Stage: Creating a Learning Community (http://www.learner.org/resources/series129.html?pop=yes&pid=1453)

Procedure

1. Go online to Annenberg/CPB's Interactive Resources by Content Area (www.learner.org). Now scroll down to the Science tab and locate the video series Learning Science Through Inquiry and open it. Now use the arrows to find Learning Science Through Inquiry (5-8) and open it.

2. Read the excerpts for each of the 8 workshops on Inquiry.


4. View at least one more video on the processes of Inquiry.

5. Use the information you learned from this activity in creating your two sequenced Inquiry lesson plans in Module 9.
Activity 8.03

The Nature of Science

You are beginning to identify a number of ideas about what science is and uncovering a wide range of attitudes and interest levels about doing science. Perspectives such as what science is, how science is really practiced and the attitudes one has toward understanding and doing science all fall into a category of science called, "Nature of Science." In short, nature of science emphasizes the processes of scientific activities, not just the products.

In this activity you will view video clips of a 4th grade science classroom, read commentary from a science curriculum expert and related literature, all to assist you in acquiring a more authentic view of science and how it can be integrated into classroom teaching. Your task is to view short video clips, then to participate in an online discussion using the questions that follow as prompts. Each of these video clips will take you through 4th grade teacher Glenn McKnight's teaching of a unit on the earthworm. When you click on one of these nine images, you can watch Glenn in action with his students. Accompanying every piece of footage are 5 different perspectives: (a) curriculum specialist, (b) professional literature, (c) Glenn McKnight, (d) Another Teacher and (e) Student.

For this activity, view the first three clips and read the accompanying text of the five perspectives.

Develop a working definition of the following characteristics of the Nature of Science:

- Science as Inquiry
- Child as Scientist
- Paradigm Shifts

Resources

Science in Elementary Education: Visit an Inquiry Classroom (prior to Fall 2007 titled The Glenn McKnight case: A Video Ethnography of Fourth-Grade Constructivist Science Teaching)
- "Nature of Science" section

California Department of Education (http://www.cde.ca.gov)
- Science Framework for California Public Schools: Chapter 2, Nature of Science and Technology section (http://www.cde.ca.gov/re/pn/fd/documents/scienceframework.pdf)

Pearson Education Portal (http://www.pearsoncustom.com/ca/calstateteach_education/)
- Visit an Inquiry Classroom â€“ Companion Videos to Peters and Stout text

Procedure

1. Read California Department of Education's Science Framework for California Public Schools: Chapter 2, Nature of Science and Technology section (www.cde.ca.gov/re/pn/fd/documents/scienceframework.pdf) and Appendix 8.03.
2. Link to Visit an Inquiry Classroom – Companion Videos to Peters and Stout text (www.pearsoncustom.com/ca/calstateteach_education/) (or load your Science in Elementary Education CD-ROM if you began the course prior to Fall 2009) and click on the Nature of Science section. (If using the CD-ROM version, make sure you have QuickTime loaded and then click on the ClickMe button in the CD-ROM’s folder, followed by the Let’s Go link to access the Nature of Science set of video segments and perspectives.) Before doing anything else, take note of the video clips which are titled:

- Science as Inquiry
- Scientific Method
- Paradigm Shifts

3. Click on the Science as Inquiry video clip. As you watch this short clip, click on the five perspectives at the bottom and read the text. Jot down your thoughts and reactions to this clip and accompanying text.

4. View the next two video clips and read the accompanying perspectives, jotting down your thoughts and reactions as you did above.

5. Now log onto your cohort’s online discussion for this activity. Compare and contrast the benefits of direct instruction with inquiry teaching. Respond to at least two other colleagues. Make particular comments regarding how inquiry supports English learners and students with special needs and discuss the direct relationship between inquiry and TPE 2: Monitoring Student Learning During Instruction. Inquiry requires careful instructional planning, which is an additional illustration of TPE 9.

6. Keep your notes for use in your Professional Reflection at the end of this module.

Online discussion posting and responses to two colleagues

Appendices for Activity 8.03
- Appendix 8.03 In Search of Understanding: The Case for Constructivist Classrooms

All appendices are available for download from the CalStateTEACH Course Website.
Inquiry-Based Instruction

This activity provides the opportunity to view an experienced teacher working with students in an inquiry-based lesson. Although this case study video is focused on the teaching of science, the same practices apply to other subjects as well. Other lessons are available at this website.

Determine what two inquiry lesson plans you will create in Module 9.

Resources

Current Text Edition

• pages 147-150

• Reference

Previous Text Edition

• pages 102-113

• Reference

Web-based Resources

Merrill Prentice Hall TeacherPrep (http://www.prenhall.com/teacherprep)
• Video Classroom, Science Methods, Module 10, Video 1 (http://www.prenhall.com/teacherprep/)

Pearson Education Portal (http://www.pearsoncustom.com/ca/calstateteach_education/)
• Video Classroom, Science Methods â€“ Earth Science, Properties of Air: Pressure

University of Georgia College of Education (http://projects.coe.uga.edu)
• Bloom's Taxonomy (http://projects.coe.uga.edu/epltt/index.php?title=Bloom%27s_Taxonomy)

Procedure

1. Read Guillaume and reference Peters & Stout for the steps to creating an inquiry-based lesson. Appendix 8.04a provides a graphic organizer illustrating the relationship between inductive and deductive teaching models.

2. View Video Classroom, Science Methods â€“ Earth Science, Properties of Air: Pressure (http://www.pearsoncustom.com/ca/calstateteach_education/) to see a teacher using a discrepant event in science to engage her students' interest.

Note: If you enrolled prior to Fall 2009, you may view this material on Merrill Prentice Hall TeacherPrep's Video Classroom, Science Methods, Module 10, Video 1
3. Begin planning two inquiry-based science lessons for your classroom. Let your Faculty know what subject area you will be using. Be sure that you have some questions in mind that will assist the students in developing their understanding of the concept you are presenting. Refer to Appendix 8.04b for assistance in creating questions that will be key to the in-depth understanding developed by your students.

The inquiry process will assist in meeting the learning needs of English learners and children with other instructional challenges. The results will provide valuable assessment data in relation to TPE 8.

4. Go online to Bloom's Taxonomy (projects.coe.uga.edu/epltt/index.php?title=Bloom%27s_Taxonomy) and familiarize yourself with the six levels of Bloom's Taxonomy as you will use them daily throughout your professional career. Take note of the old and new versions of Bloom's Taxonomy and consider which one you will use when developing questions to increase student understanding of the science concept you will teach in Module 9.

As you explore the website, ask yourself the following questions:

- How is effective instructional planning dependent on the six levels of Bloom's Taxonomy?
- How will Bloom's Taxonomy benefit my students in science and social studies as well as math and language arts?
- How will the different levels enable you to increase students' understanding of the objectives for English learners and children with other instructional challenges?

Science area you will be using for your two inquiry-based lesson plans in Module 9

Appendices for Activity 8.04
- Appendix 8.04a Deductive and Inductive Approaches to Teaching
- Appendix 8.04b Observable Verbs in the Cognitive Domain

All appendices are available for download from the CalStateTEACH Course Website.
Professional Reflection

Professional Reflection 8

In each Module of the CalStateTEACH program you are asked to analyze and reflect on yourself as a professional educator. By using the Teaching Performance Expectations (TPEs) as your framework, you are preparing for the CalTPA tasks and developing a labeling system to assist you in developing the language of teaching and learning.

Procedure

1. Submit an entry in your blog to explain levels of thinking to parents.

2. Include three activities in the homework section of your Classroom Website. One activity can illustrate recall, one can be an application activity and one will be an evaluation event. Be sure to label each activity according to the level of thinking it illustrates. Put the link to your website in the Module 8 section of your My Work folio.

- Link to your Classroom Website with blog entry and three homework activities