



Designing Effective Science Labs (6-12)

EDUO 9551 Two Semester Units/Credits

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Course Description

This course validates the time teachers will need to integrate the Next Generation Science Standards into their laboratory investigations. It will provide 6-12 science teachers with a process that will help them in the development and implementation of such labs.

Course Goals

Upon completion of this course 6-12 science teacher will:

- show understanding of assigned material
- apply the understanding to classroom labs
- collaborate with other class members

Course Objectives

The teacher will:

- read and study with understanding the course text
- read and study course website resources
- use the website resources to apply the understanding gained from the course text
- show the ability to apply the understanding by developing an NGSS lab investigation lesson plan
- collaborate with class members by posting comments about the class and the process of redesigning or designing NGSS investigating labs
- answer at least one of the posts from another class member

Course Grading Rubric

Exemplary: A+ to A-	Acceptable: B+ to B-	Unacceptable: Must be resubmitted
Shows excellent understanding of the text	The text information is understood	Not clear the text information is understood
Responses to the website resources are well thought out and relevant	All website resources are successfully responded to	Responses to the website resources are incomplete
Posts are thought provoking	Made all required posts	Posts are relevant to the class content
The answered post added to the value of the class	Completed one answered post	Did not make an answered post

Course Materials

Text:

Teaching High School Science through Inquiry and Argumentation
by Douglas Llewellyn

Website Recourses:

- http://serendip.brynmawr.edu/sci_edu/waldron/
- http://www.lessonplansinc.com/biology_lesson_plans.php
- <http://serc.carleton.edu/sp/mnstep/activities/27600.html>
- <http://www.nclark.net/Chemistry>
- <http://www.sharemylesson.com/high-school-earth-science-teaching-resources/>

Course Requirements

1. Respond to all inquiries in:
 - Show understanding of the text
 - Applying the understanding
2. Post three comments to other class participants
3. Answer at least one post made by another class participant

Course Assignments

A. Show Understanding of the Text

Read and study chapter 1 (*Constructing an Understanding of inquiry*) and create three questions that upon answering them a student would show that she/he understood the information in the chapter. Choose one of your questions and answer it with a detailed response.

A1. 1st question

A2. 2nd question

A3. 3rd question

A4. Your detailed response to either question 1, 2 or 3

Read and study chapter 2 (*Constructing an Understanding of Scientific Argument*)

A5. You want a collaborating class and you want to make the case for argumentation. How would you go about achieving both of these wants?

Read and study chapter 3 (*Learning about Inquiry and Argumentation through Case Studies*)

A6. Create only one exceptionally good question that would cover the showing of the understanding of chapter 3.

A7. Did having to answer in detail your question in A4 help you in accomplishing assignment A6? Why or why not?

Read and study chapter 4 (*Choosing to Become an Inquiry-Based Teacher*)

Create two questions concerning chapter 4. One being a very poor question and one extremely good question and the compare and contrast them.

A8. Poor question

A9. Good question

A10. Compare & contrast A8 with A9

Read & study chapter 5 (*Developing a Philosophy for Inquiry*)

A11 Compare & contrast the Traditional with the Constructivist classroom

Read & study chapter 6 (*Four Levels of Science Inquiry*) Write directions for your students using one Demonstrated Lab Inquiry, one Structured Lab Inquiry, one Guided Lab Inquiry and one Self-directed Lab Inquiry for a Biology Lab, an Earth

Science lab, a Chemistry Lab and a Physics Lab. Pair up one of lab inquiries with one of the specific science labs mentioned above.

A12. Demonstrated

A14. Structured

A15. Guided

A16. Self-directed

Read & study chapter 7 (*Modifying a lab activity into an inquiry-and Argument-Based investigation*)

Because you have successfully modified your classroom labs from traditional to a NGSS style, your district superintendent has asked you to address some of your district science teachers about the benefits of new approaches to traditional labs. Some of these teachers are close to retirement and are resistant to such a change. What would be your opening remarks to move your colleagues along with you and support modification?

A17. Your remarks

Read & study chapter 8 (*Managing the Inquiry-based Classroom*)

Because the text is a new publication, Amazon has asked you to review it for them with an emphasis on chapter 8 (do a good job for Amazon is looking for book reviewers).

A18. Your make believe Amazon review

Read & study chapter 9 (*Developing Effectective Questioning Skills*)

You need some clarifications concerning chapter 9 and are emailing the author of the text Douglas Llewellyn and asking him for help.

A19. Your make believe email with your questions.

Read & study chapter 10 (*Assessing Scientific Inquiry*)

A20. Assess chapter 10 as to its benefit in helping alleviate the anxiety over creating different assessment techniques for your NGSS labs.

Read & study chapter 11 (*Creating a Classroom Culture of Inquiry and Argumentation*)

Your principal has been approached by a local service club who wants to invite you to lunch next Wednesday to inform them what an inquiry and argumentation classroom looks like. In one paragraph state how you will make it understandable to non-educators, interesting and folksy.

A21. Your one paragraph folksy address

B. Applying the understanding

Study the following website resource

http://serendip.brynmawr.edu/sci_edu/waldron/

- B1. Choose a lab lesson in this website that you would like to direct in your classroom. Indicate the changes needed to make it a self-directed inquiry and argument based investigation.

Study the following four website resources

- http://www.lessonplansinc.com/biology_lesson_plans.php
- <http://serc.carleton.edu/sp/mnstep/activities/27600.html>
- <http://www.nclark.net/Chemistry>
- <http://www.sharemylesson.com/high-school-earth-science-teaching-resources/>

Choose one lab lesson in each website that you would like to direct in your classroom. Write out instructions for a demonstrated inquiry for the first website chosen lesson, a guided inquiry for the second, a structured inquiry for the third and self-directed for the fourth.

B2. Demonstrated

B3. Guided

B4. Structured

B5. Self-directed

B6. Now put it all together with a NGSS lab lesson that you will use in the classroom. Make this lesson plan show the instructor that you have applied your understanding of the material in the course text. Please include all the details of how you will organize the logistics (student supplies, handouts for students, etc). Describe how you will introduce your lab to your students. Include what the teacher's role is, what the student's role is, and a timeline of carrying out these activities. Include a description of the final assessment, including the student handout and accompanying rubric

C. Posts (Post your work for these items to the corresponding Discussion Forums in the course Moodle site.)

C1. State the main obstacle for you in redesigning or designing your labs to meet NGSS.

C2. Compare and contrasts the case for argumentation with a class discussion.

C3. Make an honest critique of this class on how well it prepared you to
Design Effective Science Labs.

C4. Answer at least one of your class members post.