Methods SCIENCE PROJECT
Introduction and Overview

Through this project you will develop effective methods for teaching science to the students in your current classroom placement and to assess the impact of your teaching on student learning. The project is designed to guide you through a reflective process that will benefit you in numerous ways: 1) learning about who you are becoming as a science teacher; 2) developing research skills to investigate a science topic in depth; 3) becoming familiar with the application of state and national science curriculum standards and; 4) practicing shared curriculum decision-making with your cooperating teacher. You will design an inquiry-based science learning experience using the scientific method. As you complete this project, you will integrate new knowledge on science teaching methods with much of what you have learned in earlier ESEC courses, including: 1) curriculum design and planning; 2) the use of children's literature as a means of enhancing student engagement; 3) learning and child development theories; 4) the need to be conscientiously mindful of diversity issues. The use of technology for research purposes and to enhance student learning will be an added feature of this project.

You will develop and teach at least one lesson in your classroom that includes assessing the effect of your teaching on student learning. Ideally, your site supervisor will be in attendance when you teach and will conduct an official observation to give you valuable feedback on your experience. Prior to this, you will micro-teach your lesson to your ESEC 383 peers. As a result of going through this multi-step process, you will begin to develop a teaching philosophy about the teaching of science and the kind of science teacher you want to become.

The science unit of study includes the following activities and components:

PART I. (Designed to support your learning experience)

1. Reading assignments. (These will be included in the Response Journal for the course.)
2. In-class activities to enhance your understanding of the teaching of science.

PART II. (Included in the final project to be turned in at the end of the science unit of study.)

1. A research section with an annotated bibliography on the science topic under investigation.
2. One complete lesson plan following the inquiry-based, scientific method of investigation. You will micro-teach the lesson to your peers before teaching your students. The lesson plan will include an assessment rubric that will align with the learning outcomes you have defined for your lesson. 3 student work samples. You will be asked to use the assessment rubric you designed to assess these samples.
3. A final reflection about the project, including: 1) ways you would change the project to enhance student learning; 2) a personal philosophy statement on the teaching of science, and 3) a self-assessment using the Science Project Rubric.

Steps Involved

STEP I. PLANNING AND PREPARATION

A. Select the topic.

Discuss possible science topics with your cooperating teacher. Make sure that the topic you choose is one that comes from your placement school's current science curriculum, is challenging and of interest to you and the children, and is based on New Hampshire, Massachusetts or Vermont state standards for science. **Your project will open with a 1-2 page introduction** including:

- Explanation of why you chose this topic: Inform the reader how you chose this topic, and how it fits in with your current placement's science program and how it meets state standards. Include discussion of any guidance you received from your cooperating teacher.
- Describe your project: Offer a **general overview (very little detail needed at this point)** of the content and organization of the project.

B. Research the topic from the teacher perspective. (What do *you* as a teacher need to learn in order to teach this content?)

Include a clear summary of the research you conducted in order to teach your lesson. Provide plenty of background information about your topic. Explore your own possible misconceptions about the topic and how this topic influences everyday life in any of the following ways: personal

health, characteristics and changes in populations, and/or changes in environments, the use of science and technology in local challenges. This information will provide the content (knowledge base) you need to know in order to build children's scientific knowledge and their appreciation of the impact of scientific inquiry on everyday life. **Present this information in a 2-3 page paper.** Within the paper, include developmental considerations. For the purpose of differentiation (meeting the needs of all students in your classroom), be sure that your lesson is accessible to all students in the class and takes into account diverse family backgrounds.

Include an annotated reference page that cites all of the resources you used to build this lesson, from your research to your final assessment and reflection. You should include a minimum of three teacher resources, one book for children (picture books can be applicable on all grade levels), and three web sites. You may also include other relevant curriculum resources, such as videos, community resources, software games, etc. Use A.P.A. style (5th edition).

Note: When using Internet resources and/or citations or quotes from texts, <u>always</u> provide citations. Failure to do so is considered plagiarism, which is a serious academic offense and may result in failure.

C. Determine student learning outcomes and develop an appropriate assessment tool with an accompanying rubric to explain various levels of student proficiency. (We will work together on developing rubrics.)

Consider what it is you want your students to learn as a result of your lesson. Base this on what you know about the students in your class, individually and as a whole group. Design a way to find out what they already know about the topic. Use your research into the topic as a guideline for what you will teach. Explore any misconceptions or misunderstandings the students may have about the topic before you begin teaching them new material. This will form the basis for the broader "Purpose" portion of your lesson plan and will feed directly into the "Lesson Objectives" as well. Keep the following questions in mind as you develop your assessment and its accompanying rubric:

- How will I determine if they learned what I wanted them to learn?
- How did their learning vary?
- How can I address multiple learning styles/"intelligences" through this assessment?
- Can I integrate the arts into my assessment in any way?
- How will I determine various levels of proficiency?

E. Develop your lesson plan.

As appropriate, fill in a lab recording sheet (either the one included in this packet or one provided by your school) and build your lesson plan.

Note: If your lesson will involve experimentation, be sure to carry this out fully on your own before doing it with students. Make sure it works and follow safety precautions.

<u>STEP II. INSTRUCTION</u>

A. Practice teaching your lesson.

- Share your lesson with your Methods supervisor (this can be done in person or through email), then micro-teach your lesson to your 383 peers. **Write a reflection of this experience** including the adjustments you will make based on both peer and supervisor suggestions and feedback. Title this "Micro-Teaching Reflection" in your final project.
- With your cooperating teacher, determine the most appropriate day for you to teach. Coordinate with your supervisor to determine an observation time (if possible).

B. Teach your lesson and collect Work Samples.

- After teaching your lesson according to the lesson plan you developed, collect and respond to your students' work. Apply the assessment rubric you developed and comment (using Post-It notes) directly on student work samples.

- **Include at least 3 student work samples with accompanying rubrics and comments in your final science project. Delete student names from the samples.**

Step III. PROFESSIONAL CONSIDERATIONS

A. Final Reflection

Once you have completed the project, write a "Summary Reflection" on the whole process. Be sure to include responses to the following questions:

- What worked well and what would you change if you were to teach this lesson again in the future? What could you do that would enhance student learning?
- Did your assessment measure the learning outcomes you targeted? How might that assessment be improved and/or adjusted for a different student audience?
- How have your initial feelings about science and becoming a science teacher changed throughout this process?
- What new beliefs and attitudes do you foresee emerging as a result of this experience?
- What kind of a science teacher are you becoming? Write a statement demonstrating your personal philosophy about teaching science (see *Science Stories*, p. 379).

B. Presentation

Organize the project in a professional manner in a 3-ring binder with a table of contents and tabs to identify each component. Review the rubric used for grading the project and make sure all the components are completed according to the explanations given above. **Conduct a self-assessment by filling out a copy of the rubric. Turn this in as the final piece of your science project packet.**

ALIGNMENTWITH PROFESSIONAL STANDARDS

This project was designed to develop your knowledge, skills and dispositions as a future teacher, with emphasis on your ability to positively impact student learning. The content of the project focuses on the Association for Childhood Education International (ACEI) Standard 2.2 and the following elements within that standard:

2.2 Science—Candidates know, understand, and use the fundamental concepts in the subject matter of science—including physical, life and earth and space sciences—as well as concepts in science and technology, science in personal and social perspectives, the history and nature of science, the unifying concepts of science and the inquiry processes scientists use in discovery of new knowledge to build a base for scientific and technological literacy.

Element A: Candidates have in-depth understanding of and experience w. abilities needed to do scientific inquiry.

Element B: Candidates understand the concepts in the subject matter of physical, life, earth and space sciences with in-depth knowledge of at least one of these.

Element C: Candidates understand naïve theories and misconceptions about scientific and technological phenomena and help students build understanding to avoid naïve theories and misconceptions.

Element D: Candidates have in-depth understanding of how science influences everyday living, personal health, characteristics and changes in populations, changes in environments, the use of science and technology in local challenges.

Element E: Candidates exhibit a high level of competency in teaching the content and fundamentals of physical, life, earth and space sciences using a variety of strategies.