Methods Mathematics Project
Introduction and Overview

Through this project, you will begin developing effective techniques for planning and teaching mathematics to the students in your Methods field placement. The project is designed to guide you through a reflective process as you: 1) Explore the variety of ways in which children think about working with numbers, shapes, and other mathematical ideas; 2) Practice shared curricular decision-making with your cooperating teacher; 3) Become familiar with the application of local, state and national curriculum standards; 4) Develop research skills as you investigate a specific mathematical topic; 5) Create a series of consecutive mathematics learning experiences that include presenting mathematical concepts in a variety of ways, and; 6) Learn about yourself as a mathematics teacher/learner. The learning experiences you will design for your students will involve integrating much of what you have learned in previous math courses and ESEC courses: curriculum design, the use of children's literature, and the application of theories of child development, cognition and motivation.

A key component of this project involves planning and teaching three mathematics lessons (a mini-unit). Your Methods supervisor will be in attendance when you teach at least one lesson and will conduct an official observation to give you valuable feedback. Prior to this, you will micro-teach one lesson to your ESEC 383 peers. Meet with your Methods supervisor for feedback before teaching. By going through this multi-step process, you will begin to develop a teaching philosophy about the learning and teaching of mathematics and the kind of mathematics teacher you want to become.

STEP I. PLANNING AND PREPARATION

A. Select and research the topic.

Discuss possible mathematics topics with your cooperating teacher. Also, discuss and consider the diverse needs of your classroom and how you will need to differentiate your lessons to foster learning for *all* students. After you've decided on a topic, look at the 383/386 calendar together and find a date for teaching one of the lessons. If you are able to teach all three, it would be a great experience, but is not required due to the time restraints involved in the Methods experience.

Take a good deal of time getting deep conceptual knowledge of the mathematics topic you will be teaching – not just the skills and formulas, but also the ideas. In some situations, the teacher's edition will be very useful. In other situations, you may want to consult with one of your Methods supervisors and make use of print and Web resources to make sure you understand the major ideas (that is, the 'whys' as well as the "how to's") of the math concepts you will be teaching.

Just as you will do with Dr. Tom Bassarear in class, determine other related topics that might be developed (e.g., estimation, measurement, etc.) and relevant process skills — problem solving, reasoning, communication, connections, and representations. (Refer to the handout on Blackboard as well as *Principles and Standards for School Mathematics* on reserve in the library.) Keep in mind, as you research, that you need strong knowledge of the topic before you can effectively teach your students.

- Write a short paper (1-2 pages) to summarize what you learned from your research. You might describe your deeper understanding of some of the concepts you will teach or you might describe how you came to realize how this topic is connected to other mathematical topics. Discuss the history and of the topic and the contributions of diverse cultures to that history. Try to use a mix of resource materials (i.e. teacher handbooks, web resources, children's literature, etc.). A minimum of 5 resources should be used and included in your annotated reference page.

- Follow this with an annotated reference page describing (in 2-3 sentences) all of the resources you found useful. Use A.P.A. style (5th edition) for this page.

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

B. Determine student learning outcomes and assessments.

Before you start building your actual lessons, it is important to target your overarching learning outcomes and determine what assessments you might use to meet these outcomes. After you have

talked with your teacher and explored any materials he/she has shared with you as well as resources you have found on your own, establish what you want the students to learn (the outcomes). Base this on what you know about the students in your class, individually and as a whole group. Consider what they already know about the topic and what you have learned through your research. The learning outcomes you construct will form the basis for the broader "Purpose" portion of your lesson plans and will feed directly into the specific lesson objectives (in your 3 lesson plans) as well.

The overarching assessment plan for your mini-unit must align with the learning outcomes. This plan will include both formative and summative pieces. Formative pieces enable you to monitor the progress of individuals and the whole class—to help you slow down or speed up, to catch struggling students before they get too far behind and to catch high flying students who might be bored.

- Prepare a 2-page document regarding the outcomes and assessments for this mini-unit.
The document should include:

- A list of the major outcomes of this mini-unit (concepts, skills and process competencies). Each outcome needs to be described in a full sentence. This will probably be about 1 page.
- A description of your assessment plan—both formative and summative. The formative needs to be more than simply walking around the room to see how well the children are doing. In a complete assessment plan, the reader can see that all of the outcomes of the unit are aligned with the assessments being used. This will probably run 1 page.

STEP II. INSTRUCTION

A. Plan and micro-teach your first lesson to your 383 peers.

Plan your lessons and develop the first lesson to share with your peers and your Methods supervisor.

- Write a summary of this experience including the adjustments that you made based on their suggestions and feedback. Title this "Micro-Teaching Experience" and include it in your final project.

Based on the experience of micro-teaching and the feedback from your peers and your Methods supervisor, revise your lesson plan(s).

B. Develop your lessons. Collect and respond to student work samples.

Design three sequential lessons on your mathematics topic. Use the lesson plan format provided by your 383 instructor.

- All three lessons will be part of your final project.

1. With your cooperating teacher, determine the most appropriate days for you to teach. Coordinate with your supervisor to determine an observation time.
2. After teaching your lesson, be sure to write a reflection according to the 383 Lesson Plan Format. Revise your subsequent lessons, if necessary, based on the experience of the completed lesson and feedback from your cooperating teacher and/or supervisor.
3. While teaching at least one of your lessons, collect student work samples. Think how you will evaluate the effectiveness of your lesson based on these samples.
   - Use Post-It notes to put specific comments on a few of the samples and include these samples in your final project.

STEP III. INTERVIEW

A. Interview a student.

As you have already established a relationship, interview the student you are working with on the Literacy Project regarding his/her response to the math learning experience. Develop a list of about 6-8 questions that will enable you to more thoroughly understand the child's understanding of the mathematical concepts in your unit—those ideas that you believe the child completely understands, that the child partly understands, and that the child does not yet understand.

- Write a summary of your interview. Your summary will include your questions, those comments and answers that the student gave that led you to believe s/he had complete, partial, or no understanding of the ideas.

Step IV. PROFESSIONAL CONSIDERATIONS

A. Presentation and Self-Assessment

Review the rubric used for grading the project and make sure all the components are completed according to the explanations given above. Organize the project in a professional manner in a 3-ring binder. Include:

- A table of contents and tabs to separate and identify the different components.

- Conduct a self-assessment by filling out a copy of the rubric. Turn this in as the final piece of your Mathematics Project packet.

B. Final Reflection

- Reflect (in 2-3 pages) on the process of planning and teaching math lessons by responding to the following questions. Each response will likely be a long paragraph.

1. What worked well, and what would you change if you were to teach this mathematics concept again in the future? What could you do that would further enhance student understanding?
2. To what extent did your assessments measure the learning outcomes you targeted? How might your assessments be modified to accommodate all students?
3. How have your initial feelings about mathematics and becoming a mathematics teacher changed throughout this process? Discuss preconceptions or misconceptions you may have had about the concepts you taught or about the teaching of math that have changed as a result of your work on this project.

C. Artifact Cover Sheet and Alignment w. ACEI Standards

This project was designed to develop your knowledge, skills and dispositions as a future teacher with emphasis on your ability to PLAN effectively. The project aligns with a number of Association for Childhood Education International (ACEI) Standards. Content-specific emphasis of the project relates to Standard 2.3 Mathematics.

When you turn in your final project, you will be asked to fill out an Artifact Cover Sheet that will become part of your final Keene State College Education Portfolio. On this sheet, you will explain how your work on the project aligned with the Association for Childhood Education International (ACEI)) Mathematics Standard 2.3 and the following elements within the standard.

> **2.3 Mathematics**—Candidates know, understand, and use the major concepts, procedures, and reasoning processes of mathematics that define number systems and number sense, geometry, measurement, statistics and probability, and algebra in order to foster student understanding and use of patterns, quantities, and spatial relationships that can represent phenomena, solve problems, and manage data.
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> **Element A:** Candidates demonstrate multiple ways to explore and present number concepts.
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> **Element B:** Candidates facilitate K-6 students to be focused, coherent and resourceful in the use of appropriate problem solving tools, including mental arithmetic, pencil and paper computation, a variety of manipulative and visual materials, calculators, computers and electronic information resources.
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> **Element C:** Candidates analyze their own mathematical preconceptions, misconceptions, and error patterns and construct ways to correct their own learning.