

### University Bulletin

Use of technological tools in teaching elementary mathematics. Current computer software for mathematical explorations. Teaching methods, curriculum materials, psychological factors for developing geometric and measurement concepts.

### Course Description

In this course we address teaching geometry and measurement in the elementary school mathematics curriculum. Our focus will be upon conceptual foundations of geometry and measurement in space and in the plane. We will emphasize representing and investigating basic notions of **shape, position, size, and motion**. We will include spatial and planar ideas about point sets, parallels and perpendiculars, constructions, congruence, similarity, transformations, justification by explanation, basic concepts of measuring, length, area and volume, and basic concepts of measuring with statistics and with probability. We will experience a wide variety of applied situations that can be approached with teaching methods and materials that feature investigations and projects. The underlying educational philosophy is constructivist that focuses on stimulating and guiding students to develop greater mathematical power through activities that foster conceptual understanding and higher order thinking, supported and enhanced with powerful computer tools.

### Goals & Objectives

1. To deepen our understanding of how and why we can teach geometry, measurement, probability, and statistics in ways that allow our students to experience the power, beauty, and usefulness of mathematics.
2. To have experiences in investigating problematic situations in which the mathematics of geometric and measurement reasoning can be used to interpret, analyze, conclude or predict, generalize, and understand more deeply the problem being investigated.
3. To learn about resources and tools that we mathematics teachers can use to support applied problem solving and investigations by our elementary school students.
4. To develop ideas and beliefs about teaching methods that can support our students to be actively investigating and using mathematics.
5. To collect and develop problematic situations and related materials that can be used in our mathematics classrooms.

### Starting Premises & Perspectives

1. We need to reform school mathematics to emphasize greater understanding by our students of their mathematics and its usefulness---"*...but, why do I have to learn this?*"
2. Young mathematics students can engage in deeper thinking and reasoning than is typically expected or allowed, if they are motivated and supported to do so---"*Wow, I got it!*"
3. If approached effectively, applied "real world" situations where mathematics is used will be more appealing and interesting to students---"*Where in the world will I ever use this?*"

4. Students need to be actively involved in “doing” significant mathematics---*a Chinese proverb: “I hear and I forget, I see and I remember, I do and I understand.”*
5. Being generative is the essence of being knowledgeable, and we must help our student to learn to be more self regulative & generative---*Piaget: “To invent and discover is to understand.”*
6. Cooperative mathematical activity in various groupings can facilitate student investigations and problem solving---*“I can learn from others, too, if I listen and watch and share.”*
7. A teacher’s expectations, made clear to students, can greatly affect student effort and productivity---*“If we want more, we have to expect more--of ourselves and each other.”*
8. Interpersonal relationships among students and teacher are a critical aspect of “life in classrooms,” and teachers must be alert to personality and relationship factors---*“Am I relating in positive ways, are my relationships healthy & balanced, & am I fostering these among students?”*
9. Modern technology tools must be accepted and used routinely in the mathematics classroom to further goals and activities where students actively explore and investigate their mathematics---*“What if...?”*
10. Modern school mathematics must include varied experiences with data (statistics), chance (probability), quantitative reasoning (numbers & operations), patterns (sequences), scales, rates and comparisons (ratio & proportion), change (variables & expressions), growth & decay (functions), size & location (geometry & measurement)---*“Mathematics is a rich tapestry of ideas and processes, a playground of abstraction and generality.”*
11. Factors related to cognitive and emotional development of students suggest structured play and “hands-on” explorations are essential foundations to abstracting and generalizing for building personal and shared theories of mathematics---*“The art of teaching is in the act of discovery” (Polya).*

### **Learning & Teaching Activities**

The activities in our course are chosen to support your attainment of the course goals and objectives.

#### General Expectations

1. Attendance is required, since much of the value of the course will be through the experiences that occur during our class sessions.
2. Active participation is expected, as a critical assumption for learning anything more deeply. The pedagogy being advocated and modeled through our course is the belief students must commit to, and be involved actively in, the problems posed.
3. Thorough preparation for each class session is expected. The better prepared one is for any experience, the more one will likely benefit from it.
4. Thoughtful reflection following each course experience is expected. “Looking back” at one’s experiences can help to review and consolidate what is important to remember. Being reflective can help to sort out the “slag” or discards and find the “gems” to keep. At times, it can help one to evaluate goals and strategies, and make needed changes. In general, a reflective person makes better choices and decisions.
5. Deadlines are goals which can be altered as we may need to do so. Flexibility is needed when dealing with humans, who differ in their needs and circumstances in unique ways.

6. High quality is expected at all times. All students should be expected to contribute and produce in very high quality ways, striving always to do their very best. This must be especially true of those who would choose to be a teacher of others!
7. Enjoy while you are learning. Find positive energy in our course. Deal with your anxieties or fears of mathematics. Strive to reach a new state of awareness and peace, as you achieve one more step in being an outstanding school mathematics teacher!
8. [Required statement] All academic work must meet the standards contained in “A Culture of Honesty.” Students are responsible for informing themselves about those standards before performing any academic work. [www.uga.edu/ovpi/honesty/acadhon.htm](http://www.uga.edu/ovpi/honesty/acadhon.htm)

### Specific Productions & Assignments

1. **Readings Notebook**----  
Reading and study of professional references will be assigned. You will prepare a “notebook” entry for each, to include the bibliographic citation, a very brief summary of a major idea from the reading, and a brief reaction or interpretation that reflects your thinking. All notebook entries should be prepared neatly; you are urged to prepare these using a word processor to be printed for your course portfolio.
2. **Mathematical Activities**----  
A variety of mathematical situations will be posed. These will serve as “starting points” for you to engage in explorations and investigations with the goal of solving or making discoveries for yourself. All problematic situations will be appropriate for use with elementary mathematics students. For each, prepare a neatly presented record of your productions to be included in your course portfolio.
3. **Reflections**----  
Following each class session, you should write about your experiences (be sure to note the date with each entry). Your chronologically collected journal reflections should be included in your course portfolio.
4. **Tests**----  
A mid-term examination is planned (see Course Calendar).
5. **Course Project**----  
An important learning activity of our course involves the development of a classroom implementation as a case study of children’s thinking related to geometry or measurement. Your topic and approach must be approved as a unique investigation of content appropriate to elementary school with the emphases we will develop in our discussions. Details to specify this activity will be provided separately.
6. **Course Portfolio**----  
Your course portfolio will be comprised of your productions, presented in chronological order within three separate sections: **readings notebook, mathematical activities, and reflections**. You will want to submit a neat, thorough, well-written, carefully organized portfolio. It constitutes a major portion of the assessment of your effort, attitude, growth, and achievement.

Please note: your portfolio (notebook) will be returned to you. Your Course Project report will not be returned to you.

### **Assessment & Evaluation**

1. Assessment will be a shared, on-going activity. We will assess in a variety of contexts and ways. You will be self-assessing as you work on assigned tasks and determine you need help or guidance, and as you engage in reflective analysis and journal writing. The major purpose of on-going assessment is to help you learn and grow, and to help us work with you more effectively.
2. The mid-term examination will include **100** possible points (optional extra credit item for **10** possible points). A “practice” version of the exam will be distributed and discussed to help you prepare.
3. Your written course project report will include **100** possible points. Your brief presentation of your course project will include **10** possible points.
4. A portfolio assessment will be made at the end of the term. The following items should be included in your end-of-term portfolio (with possible points as noted below):

reading notebook entries	<b>50 pts.</b>
mathematical activities	<b>80 pts.</b>
journal reflections	<b>60 pts.</b>

5. All participants must complete a course evaluation to be provided by the instructor, which will include a self-evaluation section.

**The total number of possible points for grading the entire semester is 400 (plus 10 optional extra credit points).**

7. All students must complete the instructor’s course evaluation form, which will include a self-evaluation section. Failure to do so will result in an “Incomplete” grade.

### **Resources & Materials**

1. Reprints of selected materials from texts, resources, and journals
2. Computers with software tools; GSP will be required.
3. Web-based resources, to be announced and to be found.

4. Professor:                      Dr. Larry L. Hatfield                      lhatfiel@uga.edu  
    105 Aderhold Hall                      (706) 542-4550  
    Office Hours:                      by appointment

Note: The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.