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EMAT 3400

Course Overview (PreK-5)

Children's Mathematical Learning

Spring 2009

Bulletin Description

Children's mathematical learning from pre-numerical stages through the acquisition of advanced numerical and spatial processes and operations. Research-based development of a theory of children's learning. Includes field component.

EMAT in EDEC Programs Overview

Your preparation for teaching pre-K and elementary school mathematics includes two EMAT courses. In this first course, we will focus on the child's mathematical development related to whole numbers, fractions, and decimals, with connections to early algebraic thinking. We will examine teaching strategies that reflect appropriate theory and practice from mathematics, developmental psychology, and pedagogy. The fundamental guiding perspectives will emphasize how children construct mathematical knowledge for quantitative reasoning that provides a solid preparation for success in algebra and beyond. Both the NCTM *Principles and Standards for School Mathematics* and the Georgia Performance Standards will serve as the guiding curricular frameworks. During your school-based experiences, you will complete a variety of assigned activities aimed at providing you with experiences related to children's mathematical thinking.

Goals & Objectives

1. To deepen your understanding of how and why we can teach in ways that allow our students to experience the power, beauty, and usefulness of mathematics.
2. To provide you experiences in investigating problematic situations in which the mathematics of numerical 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 can be used by to support applied problem solving and investigations of mathematical ideas by our students.
4. To develop ideas and beliefs about teaching methods that support classroom activities where our students are actively investigating and using mathematics.
5. To collect and develop problematic situations and related materials for your teaching.

Starting Premises & Assumptions

While the central emphasis will be to help you engage in conceptual analysis of the major content ideas of elementary mathematics, we will seek to make connections throughout to the Georgia Performance Standards for Grades K-5 mathematics. As a framework, it implies the nature of the young child's pre-K mathematical readiness.

In the K-12 mathematics curriculum, the GPS emphasizes that students will---

- develop mathematical understanding
- use manipulatives and a variety of representations
- work independently and cooperatively to solve problems
- estimate and compute efficiently
- conduct investigations and record findings
- apply concepts and skills in authentic problems
- understand concepts rather than perform procedures
- think critically in a mathematical way
- understand different ways to solve & sometimes more than one answer
- know some ideas well & be able to reason
- make connections and be able to communicate

These are pedagogical perspectives that we will take as fundamental assumptions:

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. With your entry to this teacher education program, the Mathematics Education faculty considers you to be a novice teacher. You have made a commitment to, and have now entered, the education profession. As such, you should conduct yourself at all times in a professional manner.
2. Attendance and punctuality are required, since much of the value of the course will be through the experiences that occur during our class sessions. You must be present to learn, and to contribute to the learning of others. If you must be absent, please try to notify me in advance. If that is not possible, please send an email or talk with me as you can. As per UGA policies, more than four (4) unexcused absences can result in being administratively withdrawn from the course.
3. Active participation is expected, a critical assumption for learning anything more deeply. The pedagogy being advocated and modeled through our course is the belief that our students must commit to, and be involved actively in, the problems and situations being posed. Be involved. Developing collegial, supportive relationships is an important aspect of the teaching profession.
4. Use of laptop computers during class is allowed only for specific course-related activities (e.g., composing notes, examining GPS, using GSP, Excel or other mathematical tools). In general, you should not engage in web browsing, email, or other questionable unrelated activities during class time.
5. Thorough preparation for each class session is expected. The better-prepared one is for any experience, the more one will likely benefit from it. In particular, try to complete assigned readings and other activities before we will discuss them in class.
6. 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 ideas and feelings, and make needed changes. In general, a reflective person makes better choices and decisions.
7. 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 in unique ways. If you need additional time that is reasonable and justified, please talk with me about it.
8. High quality is expected at all times. All participants should be expected to contribute and produce in very high quality ways, striving always to do the very best. This must be especially true of those who would choose to be a teacher of others!
9. Find enjoyment while you are growing as a teacher. Find positive energy in our course. If you have any, try to deal with your anxieties, fears, or negative feelings about mathematics. Strive to reach a new state of awareness, confidence, and peace, as you achieve one more step to become an outstanding school mathematics teacher!

Specific Productions & Assignments

1. A “journal of reflections”----

The purpose for engaging in reflective activity is to promote deeper, professional thinking. Research shows that one characteristic of the most effective teachers is that they are reflective practitioners---they intentionally and routinely think back over what they’ve done, in order to learn from it and to improve their own teaching. Therefore, following each class session from **January 14 through April 29**, you should write a “diary” or journal entry (1/2 to 1 single-spaced typed page) to express your thoughts about your experiences (be sure to note the date with each entry; don’t start each on a new page). Some suggestions to guide you---

- By thoughtful. Think back to recall what you experienced.
- Do not write a “chronology of events” (i.e., what did we/you did).
- Rather, what were you thinking or feeling? What did you like or dislike?
- What were your reactions? Agree, or disagree, with?
- About what might you be unclear, confused, or have questions or concerns?

Your chronologically collected journal reflections will be in your course portfolio.

2. A “readings notebook”----

Readings and activities will be assigned from the textbook (Reys, et al). A schedule for these assignments will be distributed. **For those specifically designated**, you will prepare a “readings notebook” entry. First, briefly identify and summarize those ideas that are important to you. Briefly discuss why you chose each, and how you might use the ideas in your mathematics teaching. All entries should be prepared neatly, using a word processor to be printed for placement in your course portfolio.

3. **Mathematical and pedagogical activities**----

As a part of continuing professional learning, any teacher of mathematics must be ready to engage in personal mathematical activity that will strengthen one’s own content background. Therefore, you will be engaged in a wide variety of mathematical situations that will be posed---all appropriate for use with elementary children (at some developmental stage). Some of these will be assigned from the textbook.

- a. Sometimes, these will serve as “starting points” for you to engage in explorations and investigations with the goal of solving or making discoveries for yourself (such as “number cousins”).
- b. You will sometimes begin a posed situation by working in a group during class. All of these will promote firsthand experiences such as children might have.
- c. Sometimes you will be asked to develop further tasks, to give you experiences in formulating or extending situations for children.
- d. You will also be assigned some mathematical activities to be completed outside of class. Most of these can be done collaboratively; a few are to be done independently, on your own.

For each, you should document what your efforts. In all cases, keep a record of your productions to be included in your course portfolio.

4. **School experiences and “activity reports”**----

During your field experiences, you will complete two important projects related to children’s mathematics.

- a. You will complete a “case study” of one child’s mathematical thinking. The purposes include giving you opportunities to deepen your understanding of the significance of children’s conceptual understandings and mathematical meanings as expected in the Georgia Performance Standards. Details for completing this will be provided in a separate handout, and discussed in class. You will produce a draft of your report [due **March 18th**] and a revised final report [due **April 1st**].
 - b. You will select a professional development task from a set of options, and write a formal paper, discussing what you did. Details will be provided and discussed. [Due **April 15th**]
5. **Course Project: “Mini-unit” (designing materials for stimulating and guiding children’s mathematics)----**
 To become an effective teacher, you must develop knowledge for designing, selecting and adapting appropriate situations for promoting children’s mathematical learning and development. In each class, you will see, and engage in, mathematical tasks that I will pose, demonstrate, and discuss. You will learn to analyze the mathematical concepts, patterns, relationships, and procedures to “unpack” the essential meanings and processes involved. It is this analysis that we then use to conceptualize and design situations to pose to the child. Across several content topics, you will be assigned activities to help you learn to do this effectively.
 - a. You will be assigned to a “topic” group. In your group, you will collaborate to develop a “mini-unit” of situations and activities to address aspects of the GPS for that topic. Specific guidelines and directions for these materials will be provided. Each member of the group must prepare tasks equivalent to a “lesson.” Peer judgments will be used for grading.
 - b. On **April 30th**, we will share these ideas. Each of the ten groups will have about 10 minutes to demonstrate and discuss ideas from their “mini-unit.” Specific details for writing the group report will be provided. Reports will not be returned.
6. **Final examination----**
 If administered, a “take home open book” Final Exam will be distributed at the end of class, **April 29th**. This must strictly be completed independently, and you must sign to affirm your compliance with the UGA Academic Honesty Policy. The exam, and your responses, will be due by **noon, Monday, May 4th**.
7. **Course Portfolio----**
 Your course portfolio will be comprised of all of your productions this term. You will want to submit a neat, thorough, well-written, carefully organized portfolio. Through it, you can demonstrate your effort, attitude, growth, and achievement. It will be due to be submitted at the beginning of our last class session [**April 30th**].

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 your need for 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. Throughout the course, various assignments will be due to be submitted (at the start of class on the date specified). “Late” submissions will be assessed a penalty---1 day late: 10%; 2 days late: 30%; after 2 days: 50%.
3. Your course portfolio will be assessed at the end of the term. The following items should be included (in clearly marked sections) in your end-of-term portfolio (with **400 possible points** as noted below):

“journal of reflections”	(50 pts.)
“readings notebook”	(20 pts.)
mathematical activities	(20 pts.)
“mini-unit” report & presentation	(100 pts.)
“case study” report [draft 10 pts; final 100 pts]	(110 pts.)
report from “other school task”	(100 pts.)

Your portfolio will be returned. When I’ve completed grading, I will notify everyone by email that it can be picked up.

4. The final examination will involve **100 possible points** (“extra credit” 10 pts.).
5. Course grades will be based on total points earned (out of **500 possible points**), using a 90-80-70-60% scale to assign final letter grades.
6. All participants must complete a course evaluation to be provided by the instructor, which will include a self-evaluation section.

Academic Honesty

The University of Georgia seeks to promote and ensure academic honesty and personal integrity among students and other members of the University community. In keeping with the University Honor Code and Academic Honesty Policy, each student is expected to do his/her academic work and to acknowledge fully and assistance and academic resources. All academic work must meet the standards contained in "A Culture of Honesty." All students are responsible to inform themselves about those standards before performing any academic work. Terms of this policy, resolution procedures, and consequences of violation are available at:

http://www.uga.edu/honesty/ahpd/culture_honesty.htm