Math 322-01: Mathematics Content and Methods for the Elementary School IV
Fall 2012

"Research on the intellectual development of the child highlights the fact that at each stage of development the child has a characteristic way of viewing the world and explaining it to himself [sic]. The task of teaching a subject to a child at any particular age is one of representing the structure of that subject in terms of the child's way of viewing things. The task can be thought of as one of translation. The general hypothesis ...is premised on the considered judgment that any idea can be represented honestly and usefully in the thought forms of children of school age, and that these first representations can later be made more powerful and precise the more easily by virtue of this early learning."

— Jerome Bruner, The Process of Education*, 1960*

Instructor: Wesley Calvert
Office: Neckers A 277
Office Hours: Official (guaranteed) hours, Tuesday 2:30–3:30, Wednesday 1:30–4:30, Thursday 8:30–10:30; also make an appointment or come see me.
Web Page: `http://www.math.siu.edu/calvert/teaching/322f12/`

Office Phone: 453-6573
Home Phone: 985-3429
Cell Phone: 534-8457
e-mail: `wcalvert@siu.edu`

Course Goals

Ability to read at the sixth-grade level is not enough to qualify a person to teach first-grade reading. In the same way, being able to do the mathematics required of elementary students is not enough to qualify a person to teach elementary mathematics. The present course is intended to give students a deep knowledge of elementary algebraic thinking and algebra, as a foundation for professional practice in teaching mathematics to elementary students.

Secondly, the course is intended to give students a sound basis in pedagogy. The successful student will have the beginnings of a tool box of teaching techniques to help all students master mathematics (and will believe that such a goal is possible!).

More broadly, students completing this course will become exemplars of the educated world to their students. It is important that the educated elite of your students' world (that is, their teacher) make being educated look good. You will do this better and better the more comfortable you are with mathematics.

Course Content

The material of the course consists of three major parts. In the first, we will look at the concept of a mathematical model. A model is a translation of some real-world situation into mathematics, made *because we want to know something about the real world* (i.e. mathematical problems stated in words do not, in themselves, constitute modeling problems). The notions of *relation* and *function*, two of the biggest gatekeeper concepts from elementary mathematics to upper-level college courses, arise naturally when we try to make models, so we'll think a good deal about them.

The point of mathematics is not to make simple things complicated, but to make complicated things simple. Therefore, we hope that modeling a situation will replace the original (real) problem with a simpler one. Of course, being "simpler" than any significant real problem still leaves a lot of room. In any case, this process is only useful if we can solve the simpler problem. The second portion of the course will have the goal of doing this.

The third major part concerns the relationship of algebra and geometry. This relationship is one of the most important accomplishments of human thought — and is important for understanding daily newspapers or machine tool operation.

Some particular topics in the course are central. Others are less central, and if time constraints demand it, we may omit some rather than doing everything badly.

Course Activities

Homework will be assigned daily or almost daily and will be due weekly, on Wednesdays at 4:30 (unless otherwise announced). You are, of course, welcome, to turn your homework in on Tuesday when we meet. If you wish, though, you may continue to work on it, and may deliver it to my office or my department mailbox.

There will be a truckload of homework, and that's not because I'm sadistic. The most common thing in all of mathematics — I do it myself, as does every other mathematician I know — is to see somebody else doing a problem and say, "Yes, yes, of course. I understand completely," and then walk away and realize that we had no idea at all what was going on. Homework is your guard against this. If you really understand how to do the homework, you're generally in pretty good shape. If you can't, you've got plenty of time to figure it out, ask me, ask a friend, or take whatever other action you see fit.

Cooperation on homework is strongly encouraged. There will almost certainly be problems on which it is necessary. Talk with each other, talk with me, talk with friends, use any resource. It is important, however, to be sure that you understand the solution you present. In designing the tests, I will assume thorough familiarity with all homework problems due before the date of the exam.

This is a course for pre-service teachers, so the ability to communicate in and about mathematics is a central requirement. Consequently, there will be several writing assignments, which will focus on deep thought and clear expression. Each writing assignment will be given with a detailed writing guide and the criteria on which it will be evaluated. Again, cooperation is encouraged, but the work you submit must be your own.

In like manner, you will be required to write a lesson plan on some subject related to the course. I hope that the practical importance of this activity needs no further explanation. The lesson plan will be assessed using the standard Elementary Education lesson plan rubric used by the Department of Curriculum and Instruction. Details on this assignment will follow.

You are also encouraged to visit me in my office (see note on office hours above) or to call or e-mail me. To be more clear: It's a hard class. I'd like to see you do well in it. I'd love to talk with you and to help you in any way that I can.

It is wise to work on the homework as it is assigned, for a couple of reasons. First, there will be enough of it that it will not be practical to just sit down and do the whole week's worth in an evening. Second (and more importantly), the material builds on itself, so that a few days without working through at least some of the problems may find you feeling a little lost.

The class will meet on Tuesdays and Thursdays at 1:00pm. A typical meeting will begin a discussion of any questions folks have, with procedural matters treated first. This will be followed by a discussion of new material (often in the form of problems, on which students will work in groups) and typically an assignment of new homework.

You should be in every class meeting, and should make sure that you are actively engaged. It goes without saying that when a problem is assigned for group work, you must do it. If you wait for me to tell you how to do it, then by the time I talk about the solution with the class, everybody else will understand it and will be ready to ask about issues you haven't encountered, and you will be lost. Don't do this. You should be careful to ask any questions you have. You should also feel free to be wrong. We all will be at some point in the class. That's why we gather together, instead of just reading the book on our own: we can help one another understand better, and we can try out ideas on each other, even if we aren't quite sure of them.

There will also be some exams. Each exam will be preceded by a review sheet indicating *exactly* what material will be covered, an in-class review session, and an out-of-class review session. Exams will be given in the regularly scheduled class time and place on September 13, October 4, and November 8. In addition, there will be a final exam. I will forward information on the final exam schedule as soon as I have it. The final will test your ability to do all of the things we have worked on in class.

The general philosophy is that class sessions and homework will be very hard and tests will be pretty easy (assuming, of course, that you've suffered through the class meetings and homework leading up to them). Again, my goal with the homework is to help you to understand the material so well that you're unhappy with me for giving such a boring (easy) test.

In all activities for this class, make sure that you *do something*. It is depressing how often students who probably know something relevant to a problem does absolutely nothing, allowing no opportunity to receive credit on the part they actually know.

Grading

Grades will be calculated from the following sources:

Homework	100pts
Writing Assignments	150pts
Lesson Plan	50pts
Regular Exams (3 @ 100pts/ea.)	300pts
Final Exam	200pts
	800pts

I regret that I will not be able to provide a detailed reading of every problem I ask you to submit. The truth is, to learn the material, you need to do more homework than I could possibly read. On each assignment, I will grade a small but representative sample of the problems. If you would like more detailed feedback on another problem, I would be glad to give it.

Failure to attend class regularly will certainly adversely affect your grades on each of these factors. For instance, while I do not artificially lower grades for bad attendance, it has consistently held that almost all grades below C- that have been achieved in classes that I have taught have been associated with significant attendance problems.

In like manner, you should not underestimate the impact of your homework. Not only does the experience of the homework problems impact your test grades, but the homework itself is a considerable portion of the grade in the class. Moreover, since you can use the book, talk with friends, talk with a tutor, ask me how to do the problem, etc., *everyone should receive a grade of near 100% on the homework.* It is depressing how rarely this happens. Indeed, due largely to negligence in completing and turning in all of the assigned problems, many students find that their homework grade instead brings their grade in the course down. Don't let this happen to you.

In all work done for this class, work is more important than answers. A correct answer without correct work (or worse, with work that does not match the answer) is not worth much at all, while generally correct work with an incorrect answer is almost as good as being completely right. Thus, getting the right answer does not guarantee a good grade on the problem, and getting a wrong answer does not guarantee a bad one.

I will make the following guarantees about letter grades. I may decide to lower these criteria (i.e. give a higher grade than the one shown here, if I see that the questions were hard enough that lower numbers more accurately reflect my true standards), but will never raise them.

Percent of total	Grade
90–100	A
80–89	B
70–79	C
60–69	D
≤ 59	E

Prerequisites

The prerequisites of this course are designed to save you from spending a semester being miserable and failing this course. *I am on your side, and wish you success. That is why I am telling you this.* To take this course, you must have a grade of C or better in Math/CI 321. Any student not meeting these requirements is *strongly* advised to delay taking this class until they are satisfied.

Emergency Procedures

Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on BERTs website at www.bert.siu.edu, Department of Safetys website www.dps.siu.edu (disaster drop down) and in Emergency Response Guideline pamphlet. Know how to respond to each type of emergency.

Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency. The Building Emergency Response Team will provide assistance to your instructor in evacuating the building or sheltering within the facility.