Some Introductory Comments About Math 221

The Goals of the Course

According to The Conceptual Framework for the Teacher Education Program of Calvin College, the mission of the program is “developing responsive and transformative educators.” This mission is to be accomplished, in part, by helping candidates develop an understanding of:

1. the impact of worldview as it relates to teaching.
2. the developmental, neuropsychological, and sociocultural factors that influence student learning and classroom climate.
3. the central concepts of, tools of inquiry for, structures of, and connections among the fields of knowledge they teach.
4. pedagogical strategies.
5. the design, implementation, and assessment of curriculum.
6. the sociocultural, economic, political, and historical contexts in which education takes place.

In what follows, I’ll try to explain how this course contributes to achieving these goals (superscripts that appear below refer back to the list of six goals).

The title of our course is

The Real Number System and Methods for Elementary School Teachers

This title suggests that the course has two major goals, one dealing with what to teach (mathematical content) and the other dealing with how to teach mathematics (methods). You should note that “methods” are often difficult to separate from “content”; what you want to teach often determines how you will teach it, and vice versa. Also, keep in mind that a goal in every course at Calvin is “the integration of faith and learning.” In our course, we’ll explore a reformed Christian perspective on the nature of mathematics, the nature of learners, and the role of school, and what implications this has for what mathematics we teach and how we teach it.

The “content” goal of the course is to help you learn the mathematics you must understand in order to teach effectively in a modern comprehensive elementary school mathematics curriculum. In mathematics, as in any subject, a teacher should have a knowledge base that is both broader and deeper than simply the particular topics she intends to help her students learn. A broad base of content knowledge enables the teacher to make intelligent curricular decisions, since she has a useful perspective on where her students have been and on where they’re headed. A deeper understanding allows the teacher to design effective instructional activities, since she can identify prerequisite skills and concepts needed for a particular topic, anticipate difficulties her students might have, and evaluate the importance of the topic to her students’ future success in mathematics.

Now this does not mean that we’ll spend class time “learning” how to compute $58 + 27$, for example. I expect everyone to know how to carry out the mathematical procedures taught in elementary school. (If you need a little review and practice for some topics, you’ll find the Musser, Burger, & Peterson textbook to be helpful.) However, we will investigate why the standard algorithm (computational procedure) for $58 + 27$ works, and what relationship that procedure has to the procedures for $58 + 2.7$ or $5/8 + 2/7$ or $0.58 \times 27.3$.

A second major goal of the course is to introduce you to methods and materials appropriate to teaching and learning mathematics in elementary school. We’ll examine current elementary school
Mathematics textbooks and discuss their content, emphases, strengths, and weaknesses. We’ll learn how to use various “manipulatives” to help children develop a good conceptual understanding of mathematics. We’ll discuss different methods of organizing students for instruction. We’ll see what research has to offer the elementary school mathematics teacher. We’ll analyze numerous activities intended for use in elementary school mathematics classrooms. We’ll evaluate the “traditional” mathematics curriculum and recent suggestions for curricular reform inspired by economic, social, and even political considerations; for example, we’ll address the “standards movement” and examine national and state curriculum standards for mathematics.

We will not make a list of every topic included in K–8 mathematics and try to decide exactly how to teach each topic on the list at each grade level. Obviously, there is not enough time in our 52 class meetings to take such an approach. Furthermore, such an approach assumes an unrealistic uniformity in the sequencing of topics and the backgrounds of students. That approach also fails to recognize the importance of an individual teacher’s independence and creativity.

**Achieving these Goals**

In the preceding section, 2 major goals for the course were described. Not coincidentally, 2 textbooks are required for this course. We might find it useful (although overly simplistic) to think of the book by Musser, Burger, & Peterson as our “mathematics” text and the book by Van de Walle as our “methods” text.

There will be two main approaches we’ll use to achieve our mathematics content goal. First, the textbook by Musser, Burger, & Peterson presents topics typically included in elementary school mathematics, but the presentations (and the associated exercises) are intended to help you develop a richer understanding of those familiar topics. Second, we’ll solve many mathematics problems, both in and out of class; doing problems in which you must decide what mathematics to use and how to use it is a good way to enhance your understanding of mathematical topics and their interrelationships.

There will also be two main approaches we’ll use to achieve our “methods” goal. First, the textbook by Van de Walle (and occasional supplementary readings that I’ll distribute) is primarily concerned with how to teach particular topics in mathematics. As we will see, this is directly connected with a deep understanding of the mathematical topics. We will often study the mathematical aspects of a topic in Musser, Burger, & Peterson and examine that topic’s pedagogical aspects in Van de Walle. Second, much of our class time will be spent in “trying out” specific activities that can be used directly (or with appropriate modification) in elementary school mathematics classes, and subsequently discussing the activities. Please note that in order to achieve the maximum benefit from these activities, you may be asked to try to think like a second grader (or fifth grader, or whatever) while participating in an activity. Don’t be insulted or embarrassed by such requests; I think you’ll soon find such role-playing to be helpful, and even kind of fun!