TE 401 Teaching subject matter to diverse learners: Mathematics

Instructor: Judy Thompson
321-8985(home)
E-mail: thomp452@msu.edu
Class time: Wednesday, 12:40-3:30
Fieldwork time: Thursday, 9:30-12:00
Office hours: by appointment

“Good Mathematics is NOT how many answers you know…but how you behave when you don’t know.”  Author Unknown

Welcome to TE 401. This course is designed to build on your learning experiences in MTH 201 and MTH 202. Although you will continue to develop your understanding of important mathematical ideas, this course shifts our focus to consider what it means to teach these ideas to children in the elementary and middle grades. To that end, we pursue mathematical ideas from the perspectives of you as a teacher and children as learners of those ideas.

At this point in your professional studies, you are ready to develop images of the kinds of classrooms that support all children in making sense of mathematics. This entails learning how to create problem solving, inquiry-based environments that promotes children’s engagement with mathematical ideas and with the doing of mathematics. Our collective work aims to help you interrogate your own knowledge, values, and beliefs about teaching and learning mathematics so as to begin to develop a curricular and pedagogical vision and a set of practices to shape the mathematical experiences of the children you will teach.

Course Goals
Mathematical domains and pedagogy. In TE 401, we concentrate on two content strands in the school curriculum: number and operations; algebraic reasoning. The first strand, the arithmetic of number, has been the traditional staple of the elementary mathematics curriculum. In typical classrooms, children spend much of their time mastering basic facts and algorithmic procedures for computing with numbers. In our course we explore ways to help students develop a rich and connected understanding of number and number-related concepts and procedures. This takes us from the development of early number concepts to the meaning of operations, to the role of number and operation concepts in the mastery of basic facts, to an understanding of place value concepts and procedures and their extension from whole numbers to decimals and percents.

The second strand, algebraic reasoning, is relatively new to the elementary mathematics curriculum. It involves recognizing, extending, and generalizing patterns with words and symbols. In fact, much of the arithmetic of number can be generalized and formalized with words and symbols (e.g., an odd number is always one more than an even number and can be expressed in the form 2n + 1 where n is any whole number). Algebraic reasoning also involves functional relationships – how the change in one variable affects another – and ways of representing functional relationships – real world contexts, tables, graphs, equations, words. In our course we explore ways to help young students develop the concepts and tools for investigating and expressing regularities in mathematics.

In addition, we explore ways to uncover and elicit children’s thinking and sense making about number, number sense, operations and algebraic reasoning and why this is important in developing your own practice.
Curriculum inquiry. We undertake a critical examination of traditional and reform curriculum materials to see (a) how ideas in a strand develop across the grades, (b) what guidance they provide to teachers about how to read and make use of them, (c) to what extent they can help novice teachers to support inquiry-oriented teaching, and (d) what teachers might learn themselves about mathematics through their use.

Planning for teaching. And we tackle what is entailed in planning for teaching – both its intellectual demands and its practical dimensions.

Classroom management. Many of the challenges novice teachers face in managing a mathematics class are entwined with choices they make about learning activities and ways to organize students to productively engage in those activities. At the same time there are some clear, practical, research-based ideas for creating productive classrooms where students’ ideas are encouraged and respected. We explore some of the principles of good classroom management in the context of creating inquiry-based mathematics classrooms in which all students can be successful.

These are ambitious goals for the short time we will spend together this semester. Therefore they require your full participation and commitment. This course is not just another hurdle to get over on your way to graduation. Rather it is the next stage in your learning to be a mathematics teacher, and there is much to learn to develop the knowledge, skills and dispositions that can make you an effective teacher. In the internship year we take up other content strands (geometry and data analysis) and we spend considerable time on assessing student learning and connecting assessment with curriculum, teaching and learning.

Contexts for Learning
Our mathematical, curricular, and pedagogical explorations will take place in four main contexts:

• our on-campus seminars;
• a Grade 3 mathematics classroom;
• your field placement;
• your self-directed study.

In our on-campus seminars we do some mathematics together, discuss assigned readings, analyze students' mathematical work, critically examine teaching events portrayed in videotapes and vignettes, and more. In the first weeks of class you conduct a classroom culture study in a grade 3 classroom. At your assigned school you observe mathematics teaching in action and investigate students' mathematical reasoning and sense making. You have the opportunity to observe and work closely with students, design and try out mathematical tasks with students, collect samples of their work, and engage in interactive teaching sessions. The self-directed study is described below.

Textbooks and Other Readings
Three textbooks are required for this course and will be used again in your internship courses. You should consider them part of your growing professional library that can support you into your first year of teaching and beyond. These texts are available at the MSU bookstore. The ISBN number for each text is given should you want to purchase them from some other source.


NOTE: Be sure you purchase the Fifth Edition.


Coursepack available at Budget Printing on Trowbridge Rd.

*Principles and Standards for School Mathematics* (2000) and *Professional Standards for Teaching Mathematics* (1991) are published by the National Council of Teachers of Mathematics. See the NCTM website at [www.nctm.org](http://www.nctm.org) and click on NCTM Standards to find the full text of these two documents. You will also find a number of applets – interactive tools for learning about mathematical concepts.

We also use the *Michigan Curriculum Framework for Mathematics*. See the Michigan Standards and Benchmarks at [www.edp.mde.state.mi.us/mef/](http://www.edp.mde.state.mi.us/mef/)

**Assignment Policies**

**Late Assignments:** Conflicts with an assignment deadline should be discussed and must be resolved before its due date. Since this class is part of your professional development, you are expected to turn in assignments on the assigned dates. If you choose to plan your time so that an assignment is late, I reserve the right to choose not to accept it or to deduct points for that assignment. If you are absent on the day an assignment is due, it will be considered late.

**Professional Writing:** TE 401 is a University tier-two writing course. We hold high expectations for seniors as you begin teaching children and move closer to the internship and a professional teaching career. Learning Log writing, in-class writing, observations and notes from classrooms can be informal, handwritten, with a major focus on ideas, and less attention to writing mechanics. Formal assignments should be word-processed and free of grammatical, spelling and punctuation errors. Only work that is handed in on time, free of spelling mistakes, and is of outstanding quality will be awarded a 4.0.

**Class Participation and Attendance**

Your thoughtful participation is essential to the success of the class and to your learning. The more effort you put into reading, writing, thinking, and discussing, the more we can all learn from one another, and the more valuable it will be for you individually. For each class meeting, you should complete any reading or writing assignments and be prepared to offer your thoughts about these in class. As a developing teacher, it is important that you learn to share your ideas and thoughts with others--including your students and your colleagues. A commitment to learning to teach and to being a supportive colleague includes being on time, being respectful and responsible in responding to other people's talk and behavior, being cooperative in helping the group function well as a learning community, being open to new ideas and reserving judgment about others' reasons and actions, and being willing to engage in lively and knowledgeable discussions about ideas and actions.

This class is a professional methods class. Dependability and punctuality are critical qualities in the profession of teaching and your regular attendance and punctuality are important to your participation in this class. There is no category for “excused” or “unexcused” absences. Excessive absences or tardiness will result in a meeting with the Team Three coordinators to assess your further progress in the program. Missing two or more classes is considered excessive and will result in a lower grade by as much as half a point on the four point scale for each such
absence. If you are sick or have an emergency that requires you to miss seminar or be late arriving, you are expected to call (or e-mail) the night before, explain the problem, and make arrangements for another student to take notes for you. You are responsible for catching up on any missed material. Similarly, if you must be absent from your field placement, you are expected to call your mentor teacher and your teaching partner (if you have one) the night before and make arrangements to make up the missed work with your partner and/or mentor teacher. All missed field time must be made up.

If you are scheduled to be in the field and the schools have a snow day you also have a snow day. We do not meet on campus in order to fill the time and you do not have to make up the missed time. You should listen to the radio or TV for school closings.

**Communication and Professional Responsibilities**

In the schools, Team Three and school staff expect you to dress, act, and talk in professional ways. (Short skirts, baggy pants, hats and casual clothes are not appropriate.) You are expected to be respectful of children and school staff and mindful of their need for teaching and learning to go on without unnecessary interruption. This means that loud talk in hallways and classrooms is not appropriate. The confidentiality of the children and their families should be maintained at all times.

**Intellectual Honesty:** Work that is not your own needs to be properly cited, whether the source is a classmate, a Web site, or a published text. Taking credit for work you did not produce is considered plagiarism, which is a serious offense with serious consequences. Work that is intellectually dishonest also includes writing a response to a text you did not read or writing up a report of a lesson you did not plan or carry out. Work that is found to be intellectually dishonest will receive a failing grade and may constitute grounds for failing the course (see your student handbook and MSU policies for students’ rights and responsibilities).

The MSU policy reads in part: "Integrity of Scholarship and Grades - The principles of truth and honesty are recognized as fundamental to a community of teachers and scholars. The University expects that both faculty and students will honor these principles and in so doing protect the validity of University grades. This means that all academic work will be done by the students to whom it is assigned, without unauthorized aid of any kind. Instructors, for their part, will exercise care in the planning and supervision of academic work, so that honest effort will be positively encouraged."

**Technology Requirement**

The State of Michigan has several technology requirements that must be met before you are allowed to begin the internship (see the Student Handbook for more detail). In our seminar you complete the “Spreadsheet and Data Base” requirement at level 1 by keeping a log of your field experiences for each day in your field placement. This assignment is graded as pass/fail and does not contribute to your grade for this course. If you fail this assignment, you are required to fulfill this requirement on your own time to the satisfaction of the Team 3 program adviser before you are allowed to begin your internship.

**Final Grade for TE 401**

The final grade in the course is an average of the math and science grades. You must pass both components to pass the course. An incomplete or failing grade for either of the two components means an incomplete or failing grade for the course. Each of the two
components is worth a total of 100 points. The final grade will be figured as a percentage of the total number of points possible (200) and grades will be assigned as follows:

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<tr>
<th>Grade Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>94-100%</td>
<td>4.0</td>
</tr>
<tr>
<td>88-93%</td>
<td>3.5</td>
</tr>
<tr>
<td>82-87%</td>
<td>3.0</td>
</tr>
<tr>
<td>76-81%</td>
<td>2.5</td>
</tr>
<tr>
<td>70-75%</td>
<td>2.0</td>
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</table>

**ASSIGNMENTS/POINTS TOWARD GRADES:**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
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<tbody>
<tr>
<td>Culture Project</td>
<td>10</td>
</tr>
<tr>
<td>Math Autobiography</td>
<td>5</td>
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<tr>
<td>Problem solving lesson</td>
<td>10</td>
</tr>
<tr>
<td>Number Lessons</td>
<td>20</td>
</tr>
<tr>
<td>Algebra Lessons</td>
<td>20</td>
</tr>
<tr>
<td>Self-directed Study of Fractions</td>
<td>15</td>
</tr>
<tr>
<td>Professional Conduct</td>
<td>10</td>
</tr>
<tr>
<td>Attendance, Participation</td>
<td></td>
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<td>Punctuality in Seminars/Field</td>
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<tr>
<td>Final Exam</td>
<td>10</td>
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**Math Autobiography:** It’s important for you to understand yourself as a math learner in order to better understand your math learners and your impact on your learners. Who are you as a learner of mathematics? Describe a positive/negative math learning experience. What made this experience positive/negative for you? How do you best learn math? What does it mean to learn math according to the NCTM Standards and VandeWalle, Chapter 2? It’s important for you to analyze your feelings about math so you can become an enthusiastic teacher of math. How do you feel about learning/doing math? How may your own feelings about math impact your future students? Explain.

**Project 1: Classroom Culture Assignment**

Part 1: Vignette from third grade classroom
Part 2: Vignette from observation of math lesson from field
Part 3: Analysis of vignettes, reflection related to one element of classroom culture

**Elements of the Classroom Learning Culture**

- **RIGHT / WRONG ANSWERS:** How are right and wrong answers treated in your classroom? What counts as a right or wrong answer and what are the roles of the teacher and students in deciding? Are different kinds of knowledge or information treated differently in this respect (e.g., conventions for spelling, punctuation, recording number sentences; narrative accounts of experience; ideas)?

- **USE OF PRAISE:** How and under what circumstances are children praised? What gets praised (good behavior, correct answers, interesting methods or ideas, other things?) What is the purpose of praise and what is its impact on students and the classroom?

- **REASONING AND SENSE-MAKING:** How and under what circumstances are reasoning and sense-making emphasized and encouraged? Are children aware of this emphasis and is their awareness evident in their talk and behavior?
• INTELLECTUAL RISK-TAKING: How and under what circumstances is intellectual risk-taking emphasized and encouraged in your classroom? Are children aware of this emphasis and is their awareness evident in their talk and behavior?

• LEARNING FROM OTHERS: What opportunities are available for your students to learn from each other? What evidence can you find that students see the ideas of other children as a resource for their own learning?

**Project 2: Planning and Teaching**

**LESSON PLAN FOR _______________________________            DATE__________**

**PURPOSE OF LESSON:** (What are the expected outcomes? What mathematical concepts are involved?)

**TRANSITION TO LESSON:** (Where will the students sit? How will I know students are ready to begin? How will I launch the lesson?)

**MATERIALS NEEDED**
By teacher:

By students:

**PROCEDURES:** (What will I say? What questions will I ask? What difficulties may come up? What will my pacing be? How will I manage transitions within the lesson?)

**SIMPLIFICATIONS:**

**EXTENSIONS:**

**ASSESSMENT:** (How will I gauge students’ learning and use that to inform my next steps? What will I look for as students work on the task? Will students self-assess by using writing?)

**CLOSURE:** (How will I wrap up or summarize this lesson?)

**WRITEUP OF TEACHING EXPERIENCE---due after each teaching session**

For each lesson you teach and submit for grading, you need to include: your detailed lesson plan and your reflection of the event. **Please staple these together.**

Use the questions below to guide your individual reflection on planning and teaching.

- What personal/mathematical preparation did you make prior to this lesson?
- What do students need to know to successfully complete the lesson?
- What are the actual outcomes for this lesson?
- What do students understand about the lesson taught? Include evidence to support your claims!
- What are some misconceptions that students have? Explain.
- How are students reasoning and making sense of this lesson? Give examples of what students said and did.
- What have you learned from teaching this lesson? What did you learn about the content, your students, and about yourself?
- How would you revise this lesson?
Project 3: Self-directed Study of Fractions

Part 1: Do Fractions of a Square, analyze using VandeWalle Activity Evaluation and Selection Guide, p. 51—Week 1

Part 2: Find resources and record ideas about teaching and learning fractions in Learning Log—Weeks 2-7

Part 3: Try Fractions of a Square with a small group of 5th graders at your school—Week 7
Include samples of students’ work and analyze the work. What do students understand about fractions? What misconceptions do students have? Did students work collaboratively? What questions did they have? How did you respond to questions/confusions? What would be your next teaching steps for these students?

Part 4: Group work to design a task with similar content for younger children—Week 8

Part 5: Read research article on teaching and learning fractions and write about new insights you have about teaching/learning fractions.—Weeks 9-13

Your completed Study of Fractions is due Week 14.