Teaching Secondary School Mathematics
ED 413
Fall 2010

<table>
<thead>
<tr>
<th>Course instructor:</th>
<th>Matt Ronfeldt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistant instructor:</td>
<td>Michaela O’Neill</td>
</tr>
<tr>
<td>Office</td>
<td>4216A (rear of Greenhouse)</td>
</tr>
<tr>
<td>Cell phone (preferred)</td>
<td>510-390-4061</td>
</tr>
<tr>
<td>Office phone</td>
<td>734-936-3656</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:ronfeldt@umich.edu">ronfeldt@umich.edu</a></td>
</tr>
</tbody>
</table>

Class meetings: Tuesdays in Room 2310
First day of class - September 7
Last day of class – December 7
Final presentations – December 21
No class on October 19 (fall break), December 14 (study week)
4:00 pm – 7:00 pm

Office hours: By appointment (email is best for setting up appointments)

I will use email and CTOOLS extensively to communicate with you and to post and receive assignments and documents for class. Be sure to let me know if internet access will be a problem for you during the course. Weekly reading, handouts, etc. will be posted on CTOOLS prior to class. It is your responsibility to check CTOOLS regularly.

OVERVIEW

This course is focused on methods of mathematics teaching practice – not only studying practice, but trying out practices as well. It is designed around opportunities to imagine, observe, experiment with, and evaluate specific instructional methods. As such, the core course assignments are “enactment sequences” where you will have opportunities to enact (rehearse) the practices we are studying first in your methods and practicum classrooms, and then later in your field placement classrooms. Thus, you will have guided opportunities to experiment with, get feedback on, and revise performance before trying out specific instructional techniques with real students in real classrooms. The practices on which this course focuses are important for good mathematics teaching and will support your daily work as a teacher.

More specifically, this course is designed around three main domains of practice:
• Providing Instructional Explanations of Mathematics
• Facilitating Small-Group Cooperative Problem Solving
• Orchestrating Whole-Class Mathematical Discussions

The main assignments of this course are enactment sequences (defined below) of these three domains of practice, as described in the section that follows. Each of these three domains of practice will be decomposed (broken down) into constituent practices that you will study and try out.

This course is simultaneously designed around what I call “instructional orientations”. The practices that teachers use are guided by specific theories and principles of teaching and learning. For example, teachers
who believe that mathematical understanding is constructed while engaging socially with other people around mathematical problems will probably not depend upon lecture as their preferred method of instruction. Rather than looking separately at practices and principles, instructional orientations are a way to think about how practices and principles go together.

As we will study in this course, for decades a sometimes contentious divide has existed between “traditional” and “progressive” (or “reform”) educators (see, for example, John Dewey’s Experience and Education, 1938), manifesting in mathematics education as the so-called “math wars”. “Traditional” instruction is often equated with a “teacher-led” orientation and “progressive/reform” instruction with a “student-led” orientation. Historically, this divide has sometimes resulted in teachers adopting wholesale one instructional orientation, while entirely dismissing others. Taking seriously Dewey’s (1938) call to reject this either-or dichotomy, this course examines various orientations to consider the affordances and constraints of each. While one instructional orientation may seem more appealing to you in general, I am hopeful we can move beyond asking “Which is a better orientation?” to “Which orientation may be better given the instructional circumstances and learning goals I may have for a specific mathematical task?”

In this course, we will consider three orientations: Teacher-Led, Student-Led, and Dialogic. These orientations are roughly characterized according to where the mathematical activity is occurring in the classroom and who is directing that activity:

- **Teacher-Led Orientation**: The teacher is primarily doing and directing the mathematical activity
- **Student-Led Orientation**: The students are primarily doing and directing the mathematical activity
- **Dialogic Orientation**: Teacher and student are jointly doing and directing the mathematical activity

These characterizations are somewhat simplistic. For instance, it actually takes a lot of teacher-directed planning and facilitation to promote student-led learning. Likewise, students can be active in constructing their understanding during a teacher-led lecture, even though they may be sitting still and quietly in their seats. Despite their imperfections, these orientations offer helpful frameworks for viewing, understanding, and enacting teaching practice.

By design, each of these instructional orientations lends itself to one of the domains of practice at the center of this course. Thus, we will study a different instructional orientation for each domain of practice:

<table>
<thead>
<tr>
<th>Domain of Practice</th>
<th>Instructional Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing an Instructional Explanation of Mathematics</td>
<td>Teacher-Led</td>
</tr>
<tr>
<td>Facilitating Small-Group Cooperative Problem Solving</td>
<td>Student-Led</td>
</tr>
<tr>
<td>Orchestrating Whole-Class Mathematical Discussions</td>
<td>Dialogic</td>
</tr>
</tbody>
</table>

This course also follows the trajectory of a common mathematics lesson sequence for problem-based instruction around cognitively demanding mathematics: **Launch-Explore-Discuss**. After learning about instructional explanations, we will study and enact *launching* a mathematical activity in such a way that provides students access to the mathematics while still maintaining a high cognitive demand. Afterwards, we will turn to the *exploration* phase – where students have an opportunity to work on rich mathematical tasks together. Though this can occur in many ways, we will consider supporting student exploration that is done collaboratively in small groups. Finally, we will learn about how to extend the learning that occurs during the exploration phase by leading a whole-class mathematical *discussion*. As culminating assignments for the course, you will be asked to teach two lessons in your field placement settings based upon the Launch-Explore-Discuss sequence we will be studying and practicing across the semester.

**Mathematics in this Course**

This is not a mathematics content course, nor is it a course on general teaching methods. This is a course focused on the teaching of mathematics. To become a teacher who effectively supports her or his students’ development of mathematical proficiency it is not enough to be really good at mathematics. It is important
that you understand and be able to do mathematics; but your main objective is to teach your students these capabilities. Knowing mathematics is different from knowing how to support others in learning mathematics. At the same time, this is not a course for learning general instructional practices for any subject areas. Promoting students’ proficiency in mathematics requires instructional supports different than those needed to promote proficiency in other subject areas, in part because what it means to be proficient varies by subject.

This course draws on the definition for mathematical proficiency provided by the National Research Council’s (NRC) Mathematics Learning Study Committee in their publication Adding It Up: Helping Children Learn Mathematics (2001). The NRC committee defines mathematical proficiency as being composed of five different, but inter-related, strands of proficiency – conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition. This multi-faceted portrait of mathematical proficiency informs the practices and principles of mathematics teaching that we study in this course. In terms of content areas, we will focus primarily on algebra, geometry, statistics, and probability.

MAIN ASSIGNMENTS/GRADING

As mentioned earlier, the course is designed around a series of enactment sequences. Each enactment sequence is really a collection of smaller assignments - an iterative cycle of increasingly complex and authentic performances of teaching practice. As we begin each assignment, I will go over the expectations in greater detail. In general, the first stage will be an opportunity to rehearse the practices we are studying in a simulated setting (in this or practicum classroom) in order to prepare you for a similar enactment in your field placement classrooms. Typically, you will be responsible for completing written lesson plans and teaching documents (handouts, prompts, etc.), oral presentations of video clips of your performances, and written self-evaluations of your enactments.

Below is an overview of the enactment sequences, the assignments you will be responsible for completing, and the specific components of these assignments:

Teacher-Led Orientation

Enactment Sequence I: Instructional Explanation of Mathematics

In the first stage of this assignment, you will work with a peer to plan and rehearse an instructional explanation on adding and subtracting negative integers using different representations. The second stage of the assignment will be to plan and rehearse an instructional explanation of mathematics that you will eventually teach in your field placement site. In the final stage, you will give your instructional explanation to students in your field site, videotape your performance, and present it during our course for discussion and feedback.

Assignment 1: Instructional Explanation - Add/Subtract Negative Integers (due Sept. 14)
   a. Outline notes to plan and guide your instructional explanation – completed mostly during class
   b. Perform and videotape instructional explanation in methods/practicum class
   c. Written reflection on video of your performance (prompts distributed later)

Assignment 2: Instructional Explanation Rehearsal Enactment (due Sept. 21)
   a. Consult with your mentor teacher to choose mathematical content and a date for delivering an instructional explanation in field site
   b. Outline notes (plan) for instructional explanation
   c. Perform and videotape rehearsal of instructional explanation in methods/practicum class
   d. Review video of your performance and write analysis (prompts distributed later)
Assignment 3: Instructional Explanation Field Enactment (due Oct. 5)
   a. Perform and videotape instructional explanation in field site
   b. Review video of your performance and write analysis (prompts distributed later)
   c. Oral presentation on enactment (with video clips) to promote class discussion and feedback

Student-Led Orientation

Enactment Sequence II: Facilitating Groupwork during Instructional Activity
During this sequence we will study and practice specific strategies for facilitating small groups of students as they work together on a mathematical task. These “facilitation moves” intend to keep the mathematical authority and activity in the possession of students, rather than the teacher “telling” the answer, while ensuring that student collaboration remains mathematically productive. We will watch video of experienced teachers using these facilitation moves and then practice using them in response to prepared vignettes. You will have another opportunity to rehearse using these facilitation moves with your peers during Enactment Sequence III (below) and again with students in your field sites (see Group-Building and Big Lesson Sequence Assignments below).

Assignment 4: Groupwork Facilitation Moves Rehearsal Enactment (due Sept. 28)
   a. Rehearsal enactment (vignettes) completed in methods/practicum class
   b. Written reflection on rehearsal enactment (above)

Enactment Sequence III: Setting and Maintaining Groupwork Norms
During this enactment sequence, you will observe and then practice one method for establishing and maintaining norms as students work on a mathematical task in small groups. After observing and studying experienced practitioners setting and maintaining norms, in the first stage of the assignment you will plan a launch for a cognitively demanding (“groupworthy”) mathematical task. During the second stage, you will rehearse your launch with peers playing the role of “students” and then practice setting and maintaining norms while your “students” work on the mathematical task. Later, in the Group-Building Lesson Sequence Assignment (see below), you will have a chance to set and maintain groupwork norms in your field placement site as your students work together on the same mathematical tasks from your rehearsal enactment.

Assignment 5: Setting & Maintaining Group Norms Rehearsal Enactment (due Oct. 12)
   a. Write-up all solutions you anticipate students may generate for your assigned mathematical task
   b. Prepare elaborated outline for launch of assigned mathematical task (including setting norms)
   c. Perform and videotape rehearsal enactment in methods/practicum class
   d. Review video of your performance and write analysis (prompts distributed later)

Dialogic Orientation

Enactment Sequence IV: Orchestrating a Whole-Class Mathematical Discussion
This enactment sequence will build upon the last. You will use the solutions that your “student” groups generated during stage 2 of the previous enactment to plan and orchestrate a whole-class discussion. Following a pedagogical model developed by Stein et al. (2010), you will purposefully select and sequence solutions that you want your “student” groups to present. During the second stage you will guide “students” as they present their solutions and orchestrate a discussion to help students make connections across solutions. You will later orchestrate a whole-class discussion of the same mathematical task in your field placement setting (see Group-Building Lesson Sequence). As part of the Culminating Lesson Sequence Assignment you will have another opportunity to practice facilitating a whole-class discussion with students in your field placement classroom.
Assignment 6: Orchestrating Discussion Rehearsal Enactment (due Oct. 26)
   a. Lesson plan for orchestrating a discussion (following model from class)
   b. Perform and videotape rehearsal enactment in methods/practicum class
   c. Review video of your performance and write analysis (prompts distributed later)

Integrating Orientations: Culminating Assignments

Group-Building Lesson Sequence
Using the same groupworthy mathematical tasks that we rehearsed teaching during Enactment Sequences III and IV, you will plan, deliver, and videotape a lesson sequence (Launch-Explore-Discuss) in your field placement. Applying the practices we studied previously, you will launch the task, set and maintain group norms, facilitate small groups as they engage with the mathematical task, and orchestrate a whole-class discussion. Later you will review your video recording, submit a written self-evaluation, and give an oral presentation about your lesson in our methods class.

Assignment 7: Group-Building Lesson Sequence Assignment (due Nov. 9)
   a. Prepare elaborated lesson plan for launch-explore-discuss sequence you will teach in field site
   b. Perform and videotape lesson sequence in field placement
   c. Review video of your performance and write analysis (prompts distributed later)
   d. Oral presentation on enactment (with video clips) to promote class discussion and feedback

Culminating Lesson Sequence
For this assignment you will work together with your mentor teacher to choose a groupworthy problem that is already a part of, or that builds upon, the curriculum in your field placement classroom. Around this problem, you will design a lesson that follows the same launch-explore-discuss sequence we have been studying and practicing throughout the semester. As you teach this lesson sequence in your field placement setting, you will videotape your performance. As before, you will later review the video recording, submit a written self-examination of your performance, and then present your lesson in our methods class for discussion and feedback.

Assignment 8: Culminating Lesson Sequence Assignment (due Dec. 7)
   a. Consult with your mentor teacher and select a groupworthy task that is aligned with the course curriculum and can lend itself to the launch-explore-discuss sequence we have been studying -- submit a copy of the mathematical task and rationale for your selection
   b. Write-up all solutions you anticipate students may generate for your assigned mathematical task
   c. Prepare elaborated lesson plan for the problem you chose that includes a launch with instructional explanation, exploration of mathematics that is done collaboratively in small groups, and a whole-class discussion
   d. Perform and videotape lesson sequence in field placement
   e. Written reflection on video performance (prompts distributed later)
   f. Oral presentation on enactment (with video clips) to promote class discussion and feedback

Assessment of Enactment Sequence Assignments (1-8)
Prior to beginning each assignment outlined above, I will distribute a handout that details the specific expectations and due dates for all components. Your grade on the assignments will depend primarily upon thorough and thoughtful completion of the various components (e.g. problem solutions, oral presentations, written reflections).

Written reflections: For written reflections, you are expected to examine your own performance of practice with a critical eye. There may be a tendency to want to avoid talking about the mistakes you made or
the challenges you faced. You may think, for example, that exposing areas of struggle will negatively impact my perception of your practice, and possibly the grade you receive on assignments. To the contrary, your capacity and willingness to identify and address areas in which you struggled, including ideas for future improvements, are essential. Failure to examine areas of struggle or uncertainty will reflect negatively in your grade. To this end, you are encouraged to ask others (peers, colleagues, instructors) to observe and evaluate your practice (live and videotaped). Feedback from others can and should provide material for your written self-evaluations. At the same time, in order for a written reflection to be “thorough,” it must also address your successes and areas you have grown.

**Oral presentations of videotaped performance:** The purpose of oral presentations is to share instances of your practice to seek feedback and to inspire discussion on common dilemmas, questions, or problems of practice. Presentations give you a chance to gather advice and feedback on areas of practice specific to you. At the same time, the examples of practice you share provide opportunities for your peers to think deeply and collectively about problems of practice that are common to us all. I will distribute specific expectations for each presentation in handouts that outline how you will be assessed. In general, oral presentations should be well-organized and about engaging, important, and relevant topics to you and to learning teachers in general. A goal of this course is to encourage you to value seeking and offering feedback on instruction as part of being a responsible professional. Teaching can feel very personal and private, so it can be scary to perform in front of others and to be critiqued by others. I will work hard to create a safe community in class where sharing and critiquing our own practice, and that of others, is valued, safe, and feels normal. As part of this, we will openly discuss and share strategies for how to seek feedback from and offer feedback to others.

**Enactment Performances:** For performance components (live and videotaped enactments), my assessment (your grade) on any given enactment of instructional practice will focus primarily upon whether you complete all components of the enactment in a way that demonstrates a genuine effort and a commitment to growth as a professional. You are a beginning teacher so neither you, nor I, can expect “expert” performance on instructional practice at this point. Instead, the goal is for you to leave this course a “well-started beginner,” as Dr. Palinscar puts it, on the path to becoming an expert teacher. I will provide feedback on the quality of your performances of the various practices we study, but your assignment grade will **not** include a performance “score” or evaluation. That said, I expect you to take seriously the feedback you receive from instructors and peers on your performances and to revise future practice accordingly. Doing so will reflect positively in my assessment of your subsequent enactments; failing to do so will reflect negatively.

**Approach to Learning**
As shown in Table 2, the Assignments 1-8 compose 80 percent of your total grade; the remaining 20 percent will be based upon your “approach” to learning, encompassing the following expectations:

- **Attendance:** You are expected to attend every class session.
- **Punctuality:** You are expected to arrive to class on time and to submit assignments on time. Unless otherwise stated, all assignments are to be posted on the course CTOOLS site **before class begins (before 4pm on the Tuesday an assignment is due).**
- **Reading:** Rather than covering many articles in less depth, this course requires you to go deeply into fewer articles. Each week you will be expected to read one or two articles before class begins. As you read, you should synthesize the main points of the article and prepare questions that you would like to discuss. Typically we will spend some time each week discussing the reading in small groups and/or as a whole class. You are not expected to submit anything in writing, but are expected to contribute to conversations about the reading (see below).
- **Participation:** Sharing your ideas in class is critical for your learning and the learning of others. I recognize that it is easier for some people than others to speak out in class. Though you are not expected to talk all the time, you are expected to participate consistently and thoughtfully. There will be many and different kinds of opportunities in class to actively participate.
Small-group and whole-class reading discussions – Though we learn a lot just from reading the articles, often the most powerful insights emerge in conversation with others. You are expected to actively listen to the perspectives of others and to actively share your own.

Live enactments in class – As described above, you will be performing various practices during class time (e.g. in role play simulations and rehearsals). Rather than just go through the motions, you are expected to get into role and make your effort as authentic as possible. Also, your active participation should continue after you have performed a given practice. You are expected to seek out feedback from your peers and instructor on your performances to improve future efforts.

Offering feedback to peers on their enactments (live and videotaped) -- Part of becoming a professional is learning to provide and receive feedback in appropriate ways. Feedback is critical for improving teaching practice. Thus, you are also expected to provide feedback to peers on their efforts to enact practice – supportive comments but also constructive criticism where needed. We will work together on establishing norms for giving and receiving feedback.

Electronics Etiquette: I love to use laptops, smart phones, and other hand-held devices as much as you probably do. That is precisely why I feel strongly about having some explicit expectations about their use in class. Common sense demonstrates, and research is now showing, that we are not as good at multi-tasking with electronic devices as we may think.\(^1\) I ask that all electronic devices be off during class time (from 4pm-7pm on Tuesdays) except during class breaks (get your fix!) and when electronics are explicitly integrated into assignments (e.g. you must use video equipment to present video clips of your field enactments). And then there is the special case of the laptop. For students who use laptops to take notes, refer to articles during class discussions, etc. I request that you disable internet capabilities while our class is in session. If you cannot disable internet, then I ask that you NOT access the web during class. And, yes, having your email or Facebook browsers open but minimized still counts as accessing the web. There are always exceptional circumstances and technologies – please see me with specific concerns that you’d like to discuss, and we’ll make arrangements that work for us all.

Approach Grades: Everyone begins the year with a perfect approach score; any and all failures to meet the above approach expectations will result in lowering your approach score. If you know in advance that you will be unable to meet any of these expectations at any point during the semester (e.g. you cannot make a particular class or cannot meet an assignment deadline) than you are expected to notify me by email, with reasonable advance notice, to discuss your circumstances and possible accommodations/arrangements (e.g. getting handouts from a class you will miss, planning an assignment extension date). Should you be unable to submit an assignment on time, contact me by email no later than 48 hours prior to the due date to discuss adjusting the deadline.

---

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Due Dates (Tentative)</th>
<th>Percentage of Total Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1: Instructional Explanation (Add/Subtract Integers)</td>
<td>Tuesday, September 14</td>
<td>7</td>
</tr>
<tr>
<td>Assignment 2: Instructional Explanation (Rehearsal Enactment)</td>
<td>Tuesday, September 21</td>
<td>7</td>
</tr>
<tr>
<td>Assignment 3: Instructional Explanation (Field Enactment)</td>
<td>Tuesday, October 5</td>
<td>10</td>
</tr>
<tr>
<td>Assignment 4: Groupwork Facilitation Moves (Rehearsal Enactment)</td>
<td>Tuesday, September 28</td>
<td>2</td>
</tr>
<tr>
<td>Assignment 5: Setting &amp; Maintaining Groupwork Norms (Rehearsal Enactment)</td>
<td>Tuesday, October 12</td>
<td>7</td>
</tr>
<tr>
<td>Assignment 6: Orchestrating Whole-Class Discussion (Rehearsal Enactment)</td>
<td>Tuesday, October 26</td>
<td>7</td>
</tr>
<tr>
<td>Assignment 7: Group-Building Lesson Sequence Assignment</td>
<td>Tuesday, November 9</td>
<td>15</td>
</tr>
<tr>
<td>Assignment 8: Culminating Lesson Sequence Assignment</td>
<td>Tuesday, December 7</td>
<td>25</td>
</tr>
<tr>
<td>Approach to Learning: Attendance, Punctuality, Participation, Effort, Engagement</td>
<td>Ongoing</td>
<td>20</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

According to the percentage accumulated by the end of the semester, you will be assigned a letter grade as follows:

- 95-100  A
- 90-94   A-
- 85-89   B+
- 80-84   B
- 75-79   B-
- 70-74   C+
- 60-69   C
- Below   Must retake course and may not student teach until earning a grade higher than C

**Electronic Submissions**
Submit all assignments (except for video – see below) on CTOOLS. Label your files with your uniqname, assignment number, followed by ED413 (e.g., RonfeldtAsst1ED413.doc). If an assignment includes many parts, please combine them into a single document rather than submitting many different documents. Please do not email assignments. Note that I will not be able to read files with the wps or cwk extensions. Your options include PDF or Microsoft Word (doc).

**Video Submissions**
You will submit video recording of many rehearsals and field enactments that will accompany the documents you submit on CTOOLS. Because of the size of these files, we will not be using Blue Stream instead of CTOOLS to submit them. During class we will review how to upload files onto this system, file naming expectations, and how to identify time codes.

**Required Reading**
The only required text for this course is *Designing Groupwork: Strategies for Heterogeneous Classrooms* by Elizabeth Cohen. A recommended, but optional, text is *Teaching Problems and the Problems of Teaching* by Magdalene Lampert. You will be able to download all other assigned reading on CTOOLS.