

M572: Algebra for teachers

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Office Hours: Schedule at www.fapeck.com/meeting

Course webpage (Moodle): <http://www.umonline.umd.edu>

We are mathematicians.

We ask questions

We **wonder** about the world—the “real” world and the world of mathematics

We are **sense-makers**

We experience **confusion, anxiety and joy**

We create and use **models, tools, and strategies** to mathematize the world

We are teachers.

We approach pedagogical interactions as **teacher-learners**

We find the right **models, tools, and strategies** to help people learn

We seek to foster **wonder, perplexity, and understanding**

We’re not afraid of a little **confusion or anxiety**

We treat all learners as **people** and promote their development as people

We are a **community**.

We are **mathematicians**.

We are **teachers**.

About the course

Algebra is often used as a noun, and is associated with a particular kind of mathematical *content* to be learned. Courses that cover this content often have the word “algebra” in their names: “Algebra I,” “Algebra II,” “College Algebra,” “Abstract Algebra,” etc. In this course, rather than conceptualizing of algebra as a noun, we will explore what it means to think about algebra as a *verb*:

Algebra is the human activity of *algebratizing*:
structuring the world (including the mathematical world) by finding
relationships, generalizing, abstracting, and justifying.

In other words, we will conceptualize algebra as something we *do*—an activity or practice—rather than something we *learn*. We will engage in the activity of algebratizing, and explore what such a perspective might mean for teaching-learning.

Learning outcome

The main outcome of the course is that **participants will *develop* as mathematicians and teachers.** Development involves the acquisition of knowledgeable skill, but it’s much bigger than acquiring content knowledge. Development involves *becoming* a member of a community, and thus it affects not simply what we *know*, but also who we *are*. Therefore, development cannot be reduced to an enumerated list of learning outcomes nor can it be standardized across participants.

We develop as members of a community as we participate in the practices of that community. Thus, rather than thinking about the course in terms of *outcomes* to be attained, it is better to think about the course in terms of *practices* to participate in. During the course, participants will (a) participate in the human activity of algebratizing, and (b) participate as a member of a mathematical community.

Course activities and deliverables

1. **Mathematical investigations and peer review:** The primary mathematical activity of the course is to conduct mathematical investigations that involve *algebratizing* a “landscape of investigation.” This involves:

- Conduct an **investigation**. From a given starting point, develop and follow interesting questions. Algebratize. (~4 hours)
- Produce a **write-up** of your findings that explains, to a mathematically-literate reader, what you investigated, what you found, and the mathematical reasoning behind your findings (~2 hours).
- Provide **feedback** on a peer’s investigation. Take time to understand their reasoning. Provide written feedback, including questions that you have (~2 hours).

Notice the expectation that the investigation itself should take approximately 4 hours. These are not the typical “school-like” exercises that we expect to complete in 5-10 minutes. These are big, open landscapes that take a long time to investigate. As you engage in investigations, you should take the words on the front page of this syllabus to heart. Algebratizing is a *human* activity, and thus engages all of our humanity. Don’t be surprised to feel emotions like confusion, anxiety, and joy.

More information about the expectations for investigations will be provided on the website.

Deliverable: Each week (by Sunday at midnight) you will submit your investigations to Moodle and to a peer for peer-review. You should return your peer review by the following Wednesday.

2. **Pedagogical readings and discussion:** Each week, you will have brief pedagogical readings that describe aspects of *algebratizing* and ways of engaging students of all levels in algebraic activity. We will discuss these readings on Moodle (~4 hours for readings, and ~2 hours for discussion).

Deliverable: Each week there will be a Moodle discussion on the assigned reading. In general, the expectation is that you will post an initial response by mid-week, and engage thoughtfully in a discussion for the rest of the week.

3. **Portfolio of mathematical and professional activity:** In week 5, you will prepare a portfolio of mathematical and professional activity. The portfolio will be graded. The portfolio should contain:

- **Mathematics:** Choose two investigations that provide the best evidence of your mathematical work in the course. You can (and should!) revise the investigations based on your feedback.
- **Pedagogy:** *Algebratize* a content standard through a landscape of investigation.

You will have time during week 5 to work on the portfolio. More information about the expectations for the portfolio will be provided on the website.

Deliverable: Submit your portfolio (in electronic form) to Moodle by Friday June 25.

Feedback and Grading

Feedback

You should expect to receive the following feedback on your investigations:

- **Peer review:** Each week you will send your investigations to one peer for review. Your peer will provide feedback on your mathematical reasoning and communication. You will receive a peer review for each investigation.
- **Peer review from Fred:** I will participate in the peer review, and will provide detailed peer feedback on one investigation for each person in the course.
- **“In-progress” rating from Fred:** The investigations won’t be graded until they are submitted in the final portfolio. For each investigation, I’ll give you an “in progress” rating, based on how the investigation meets the expectations of the final portfolio. These ratings will not be recorded as grades, but they should give you a sense for how the investigation would be graded as part of the final portfolio. I will provide detailed guidelines and rubrics for the portfolio.

Grading

Your grade is based on the following:

- **Participation in mathematical practices 60%:** This will be assessed using weekly self-assessments. At the end of each week, you will complete a brief self-assessment, in which you assess the extent to which you participated in the class activities that week.
- **Evidence of mathematical and professional learning 40%:** This will be assessed using your final portfolio. Your final portfolio should provide your best evidence of your ability to *algebratize* (as a mathematician) and to engage your students in the activity of algebratizing (as a teacher). In week 3, I will provide detailed guidelines and rubrics for the portfolio.

Time commitment

Because we are condensing a 15-week course into five weeks, there is a lot of work each week.

Please keep this in mind.

You should expect to spend ~3 hours per day (~15 hours per week) on the course. I structured the schedule with flexibility in mind. Each week there is a mid-week due date (on Weds at midnight) and an end-of-the-week due date (on Sunday at midnight). Within those fixed due dates, you can structure the activity in whatever way is most convenient for you. You can use the weekends to work if that is convenient, but that is not an expectation.

Schedule

The schedule below is tentative. We will probably follow it, but it is subject to change based on the progress of the course. Each week I will post the expectations and schedule for the week on Moodle. You should defer to that schedule. Notice that the schedule for week 1 is slightly different than the other weeks. In week 1 we have more readings, but no peer review or reading discussion.

		Investigation	Pedagogical reading
Week 1:	Part a (through Wed)		Big idea #1: Algebra as an activity Big idea #2: Landscapes of investigation
	Part b (through Sun)	Investigation 1	Big idea #3: Mathematical communities
Week 2	Part a (through Wed)	Peer review of Investigation 1	Algebratizing relationships: <i>functional thinking</i>
	Part b (through Sun)	Investigation 2	Participate in discussion
Week 3	Part a (through Wed)	Peer review of Investigation 2	Algebratizing the mathematical world: <i>generalizing and justifying</i>
	Part b (through Sun)	Investigation 3	Participate in discussion
Week 4	Part a (through Wed)	Peer review of Investigation 3	Algebratizing the lived-in world: <i>mathematical modeling</i>
	Part b (through Sun)	Investigation 4	Participate in discussion
Week 5	Part a (through Wed)	Peer review of Investigation 4	Making algebraic tools meaningful: <i>Representations and symbols sense.</i>
	Part b (through Fri)	Assemble portfolio	Participate in discussion

Asking for and providing help

The nature of an online course is that there is a lot of independent work. As you work through the lab workbook, you may have questions, including questions related to statistical practices and content, and questions related to using Tinkerplots software.

In a community of learners, we all have a responsibility to ask for and to provide help.

When you have a question, please post it to the course “Q and A” discussion forum. Everyone should monitor this forum, and we should see responding to questions as a collective responsibility. If you can help a colleague who has a question, please do. As a member of the community, I will also monitor the forum and I will try to respond to questions in a timely manner. Others should do the same.

Meeting

If you would like to meet with me, with can do so via Skype (fredpeck1), Google Hangout (frederick.peck@gmail.com), or phone call (406.243.4053). Please schedule a meeting using the URL below:

www.fapeck.com/meeting

Other policies

Communicating: Email is the best way to reach me. UM policy states that I must use your UM email account when I correspond with you. Please email me from your UM account—that makes it easy to follow the policy! Even if you don’t, I still have to reply to your UM account.

Classroom and testing accommodations: The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.

Academic honesty: All students need to be familiar with the Student Conduct Code. You can find it in the “A to Z Index” on the UM home page. All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University.