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M 132.B02: Numbers and Operations for Elementary School Teachers

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M132: NUMBER AND OPERATIONS FOR K-8 TEACHERS

UNIVERSITY OF MONTANA

FALL 2020

We are a community.

We explain, argue, and persuade
We collaborate
We act with grace
We hold each other accountable

We are mathematicians.

We wonder and ask questions
We create and use models, tools, and strategies
We are sense-makers
We experience confusion, anxiety, and joy

We are teachers.

We foster wonder, perplexity, and understanding
We're not afraid of a little confusion or anxiety
We treat all learners as people

Hi, I'm Fred.

I use the pronouns he/him/his.

You can email me at: frederick.peck@umontana.edu

My website is http://www.fapeck.com and my twitter is @frederickpeck

You can visit me during my office hours: Thursdays, 2-4 via Zoom: https://umontana.zoom.us/j/95860949309?pwd=YW9XOUZiMjFrMm5ZVTAvRCsxcXRtUT09

We can meet anytime that is convenient for you. Schedule at www.fapeck.com/meeting

I'm looking forward to our course together!

ABOUT THE COURSE

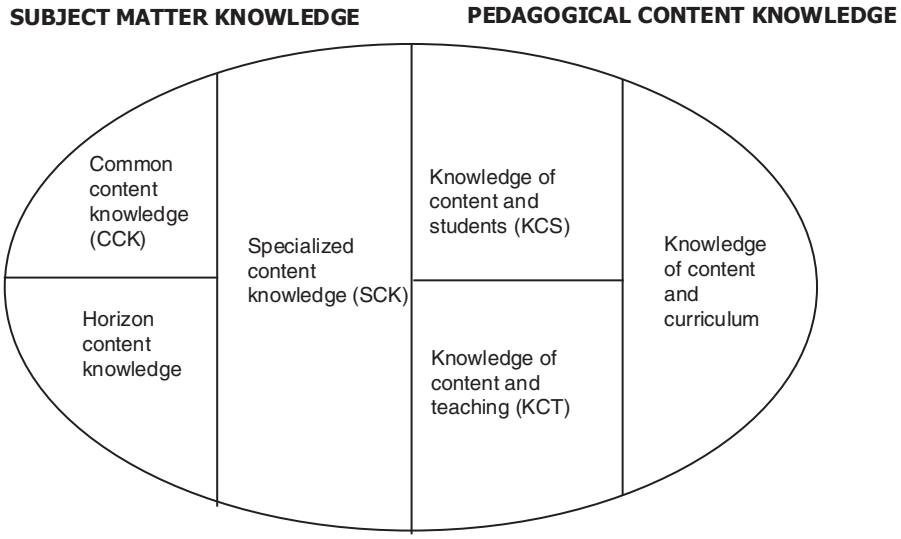
This course is animated by a deceptively simple question:[1]

"Who knows mathematics well enough to teach third grade?"

The answer is, very few of us. Teaching is an extraordinarily intellectually demanding profession, and it requires a special kind of knowledge. With respect to math, we call this knowledge *mathematical knowledge for teaching*, or MKT.

As shown in the graphic below[2], MKT involves both *subject matter knowledge* (knowledge about math content) and *pedagogical content knowledge* (knowledge about teaching math). Both of these are special for teachers. It's not enough to know math the way a research mathematician might or an engineer might.

Because MKT is special to teaching, this course is especially for teachers.



[1] Ball, D. L., Hill, H. C., & Bass, H. (2005). Knowing mathematics for teaching: Who knows mathematics well enough to teach third grade, and how can we decide? *American Educator*, *29*(1), 14–17, 20–22, 43–46.

[2] Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education*, *59*(5), 389–407.

LEARNING OUTCOMES/COURSE OBJECTIVES

Upon successful completion of this course students will:

Develop as a mathematician and a teacher

1. View mathematics as the human activity of structuring the world
2. Participate with confidence in mathematical activity
3. Become a more-central participant in the community of mathematics teachers

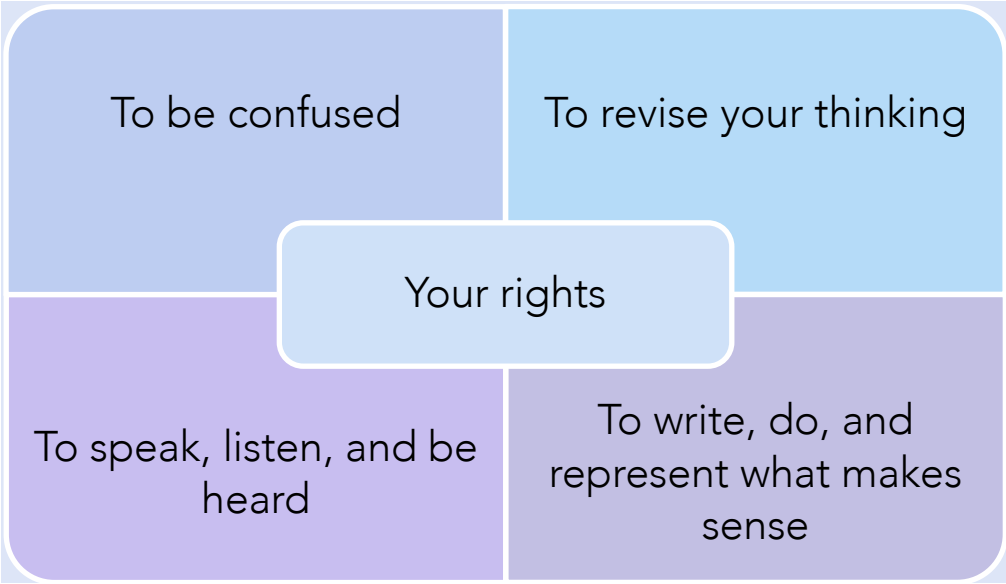
Have subject matter knowledge

4. Understand the meanings and uses of whole numbers, integers, and fractions, as well as representations of those numbers (including place value, decimal [base-10] notation, and fraction notation, all from a *units perspective*)
5. Understand the meanings of addition, subtraction, multiplication, and division; Understand the connections between these operations, concepts, and procedures—including explaining how standard US algorithms work.
6. Solve problems involving numbers and operations
    - Use *models* and *number-sensible strategies* to solve problems
    - Perform U.S. traditional algorithms for operations on whole numbers, fractions, and numbers in decimal notation
    - Explain their reasoning, both verbally and in writing, while solving problems.

Have pedagogical content knowledge

7. Have a working knowledge of how students learn number and operations in formal education
    - Understand the role of models, tools, representations, and strategies in teaching-learning mathematics.
    - Evaluate student work regarding numbers and operations, determine the mathematical reasoning and strategies used, and recognize some common mistakes, including the reasoning that makes these mistakes sensible
    - Formulate feedback and identify instructional activities to further students' learning

YOUR RIGHTS



YOU HAVE THE RIGHT TO BE CONFUSED. Being confused is actually a good thing. Feeling confused is an important part of learning. If you are confused, don't try to hide it. Exercise your right! Say, "I don't understand this… yet."

YOU HAVE THE RIGHT TO REVISE YOUR THINKING. Nothing is set in stone. You may notice that you made a mistake. Claim it! You may get some feedback. Respond to it! Learning is a process and revision is an important part of that process.

YOU HAVE THE RIGHT TO SPEAK, LISTEN, AND BE HEARD. Learning and doing mathematics is a social enterprise. We will offer multiple ways for you to communicate and collaborate with others.

YOU HAVE THE RIGHT TO DO ONLY WHAT MAKES SENSE. Math should make sense. If you find yourself doing something, but you can't really explain why, then claim your right and stop. Do what makes sense to you. This is not to say that anything goes. You may get some feedback which causes you to revise your thinking. This also means that you have the right to use words and symbols that make sense to you. We will introduce new vocabulary and symbols in this class, and we'll help you learn to use them. As you are learning, please use language that makes sense to you.[3]

[3] These are based on work by Olga Torres (https://www.youtube.com/watch?v=_UndpNUCAqw) and Crystal Kalinec-Craig (https://embracinglifewithmajorrevisions.org/rights-of-the-learner-blogs/)

ADMINISTRATIVE THINGS

CLASS TIME: MWF 1:00-1:50

LOCATION: MLIB 410

TEXT: There is no required textbook. Some readings will be provided on the course website.

SUPPLIES: Please bring a laptop, tablet, or smart phone to class if you can.

FINAL EXAM PERIOD: Thursday Nov 19, 1:10—3:10

About the final exam: We will engage in a summative activity during the University-scheduled time. The final exam schedule is set by the university schedule and the time cannot be changed. Please make your travel arrangement based on the scheduled final exams.

HELP! / OFFICE HOURS

Teaching-learning is collaborative endeavor, and seeking and providing help is a joint responsibility that is shared by all members of the community. I will seek to recognize when you need help, and I will do my best to provide you with help as much as I can. You should also seek to recognize when your colleagues need help, and try your best to provide it. Finally, you should seek help for yourself as much as you can.

I schedule my office hours so that they are convenient for students in M132. My office hours are:

- Mondays, 9:00 – 10:00 in the lounge outside of the Heart and Soul Café in the LA building (right after class, outside of our classroom)
- Wednesdays, 1:00 – 2:00 in the second-floor study lounge of the education building.

I hope you will join me! You can also use this link to set up a meeting any time that is convenient for you: http://www.fapeck.com/meeting.

In addition, free drop-in tutoring is available in the Math Learning Center on the oval, in the Math Building room 011.

COURSE ACTIVITIES

IN-CLASS ACTIVITIES AND DISCUSSION: Education researchers have spent decades studying how people learn math. The research is clear: **we learn more when we are actively engaged than when we are passively listening to a lecture**. Therefore, our class sessions will involve "active learning" including activities and discussion.

- I do not expect that you will "know" how to do every activity. In many cases, you won't! That's because I will often ask you to engage in activities in order to learn something new.
- I do expect that you will engage deeply and thoughtfully in class activities, and that you exercise all of your rights as a learner.

PRACTICE, PREPARATION, AND EXTENSION ACTIVITIES: PPE activities are done outside of class. You can work together on the PPE activities and use any resources that are helpful.

PPE activities are basically a sandbox: a place for you to try things out and see how they work. In order for this to be successful:

→ *You have to engage thoughtfully with every problem.* Some problems may be challenging! You may be confused! That's okay! Remember, you have the right to be confused. The activities are a sandbox, a place to play. They are not an evaluation.

→ *You have to get some feedback.* We will discuss PPE activities in class.

→ *You have to get help.* If, after getting feedback, you are still confused about something, congratulations! This is a very important part of learning. They key is that, when you are confused, you seek help. See the section on Help.

PORTFOLIOS: Neither group work, nor practice & extension activities, are graded. At the end of each unit, you will choose the best pieces and assemble these pieces into a portfolio of work that demonstrates your mastery of the unit objectives. Your grade will be based on these portfolios. I will provide detailed instructions for each portfolio when it is assigned.

Remember, you have the right to revise your thinking. You may revise and resubmit your portfolios for full credit, based on feedback.

WEEKLY SELF-ASSESSMENT: Each week you will complete a brief self-assessment of your participation in mathematical and pedagogical activity for the week.

TIMING AND DUE DATES

Math has nothing to do with speed! None of the above will be timed. Deadlines are in place to keep everyone on track, but if they are not reasonable for you, we can negotiate them. *You should plan to spend approximately 3-4 hours each week outside of class on work for this course*.

FEEDBACK AND GRADING

Mathematics is both an activity that you do and content that you learn. Your grade in this class is based both on what you *do* (your participation in course activity, 50%), and what you *learn* (your mastery of mathematical knowledge for teaching, 50%), as described below.

PARTICIPATION IN COURSE ACTIVITY (OBJECTIVES 1–3; 50%)

We develop as people through our participation in activity. In our class, you will develop as a mathematician and a teacher as you participate in mathematical and pedagogical activity. To be an active participant, you should:

(a) be present,
(b) be prepared (by completing out-of-class activities), and
(c) be productively engaged in our course activities and discussions.

MASTERY OF MATHEMATICAL KNOWLEDGE FOR TEACHING (OBJECTIVES 4–7; 50%)

Rather than accumulating points for "correctness," your grade will be based on the extent to which you demonstrate mastery on the course objectives for MKT (objectives 4–7). At the end of each unit, you will assemble a portfolio of work that demonstrates your mastery of the unit objectives.

I expect that you will demonstrate mastery of every objective. Portfolios that do not demonstrate appropriate mastery will be returned with feedback, and you will be expected to revise the portfolio and resubmit it, possibly multiple times, until the work in the portfolio demonstrates appropriate mastery.

FINAL GRADE

I will determine your course average by weighting your activity score and content score 50% each.

Then, your letter grade is assigned based on your course average, according to the standard 90-80-70 scale.

OUR COLLECTIVE RESPONSIBILITY TO PROMOTE PUBLIC HEALTH

We are experiencing a global pandemic. We are called upon to engage in practices to promote collective wellbeing and public health.

- Mask use is required within the classroom. View UM's face covering policy: https://www.umt.edu/coronavirus/mask-policy.php
- We have all been provided with a Healthy Griz kit. Everyone is expected to clean their personal work space when they arrive for class, and again before they leave the classroom.
- Refill stations for cleaning supplies/hand sanitizer will be set up around campus - please learn where they are and use them.
- Classrooms may have one-way entrances/exits. Please follow posted guidance.
- Please try not to congregate outside the classroom before and after class.
- Unless there is a health rationale, drinking and eating food (which requires mask removal) is not allowed within the classroom.
- Stay home and contact the Curry Health Center at (406) 243-4330 if you feel sick and/or if exhibiting COVID-19 symptoms.
- If you are diagnosed with COVID-19, follow instructions for quarantine and contact your advisor so they can help you stay on track academically.
- Please remain vigilant outside the classroom and help mitigate the spread of COVID-19.
- You can find up-to-date information on the UM coronavirus website: https://www.umt.edu/coronavirus

Let's all care for each other.

POLICIES AND RESOURCES

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.

ATTENDANCE/PARTICIPATION: You are preparing for a profession in which timeliness and attendance are strict and non-negotiable. In addition, we will do important activities each day. For these reasons, I expect that you attend every class. Things come up, and I understand that. If you know you are going to miss class, please make arrangements with me before hand. If you miss a class that you didn't expect to, please contact me as soon as you can so we can arrange a makeup activity.

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 have a disability that adversely affects 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.

CULTURAL, FAMILY, AND HEALTH LEAVE: Please know that I understand that you are a human and that you have a life and responsibilities outside of this course. I will work with you to make sure that you can participate in or attend to any out of class responsibility you have.

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.

GRADING: You must earn a grade of C- or better in this course to fulfill the requirement in the College of Education. You may change to CR/NC up to the last day of class and you will receive credit with a grade of D- or better. However, if you choose this option the grade cannot be counted toward the College of Education requirement nor the UM graduate requirement.

FOOD AND HOUSING INSECURITY: Any student who faces challenges securing food or housing, and believes that this could affect their performance in this course, is urged to contact any or all of the following campuses resources:

> *Food Pantry Program:* UM offers a food pantry that students can access for emergency food. The pantry is open on Tuesdays from 12 to 5 PM and Fridays from 10 AM to 5 PM. The pantry is located in UC 119 (in the former ASUM Childcare offices). Pantry staff operate several satellite food cupboards on campus (including one at Missoula College). For more information about this program, email umpantry@mso.umt.edu, visit the UM Food Pantry website (www.umt.edu/pantry)

or contact the pantry on social media (@pantryUm on twitter, @UMPantry on Facebook, um_pantry on Instagram).

ASUM Renter Center: The Renter Center has compiled a list of resources (https://medium.com/griz-renter-blog) for UM students at risk of homelessness or food insecurity. Students can schedule an appointment with Renter Center staff to discuss their situation and receive information, support, and referrals.

TRiO Student Support Services: TRiO serves UM students who are low-income, first-generation college students or have documented disabilities. TRiO services include a textbook loan program, scholarships and financial aid help, academic advising, coaching, and tutoring. Students can check their eligibility (www.umt.edu/triosss/apply.php) for TRiO services online. If you are comfortable, please come see members of the teaching team. We will do our best to help connect you with additional resources.

A FINAL NOTE: THE IMPORTANCE OF OUR COLLECTIVE WELLBEING

This is a challenging and uncertain time for all of us. Even as we gather together to learn statistics, our priority is our collective wellbeing. Please act gracefully and patiently with each other. We may experience sudden changes. We will have to face these changes with grace, understanding, and flexibility. If you experience life challenges that get in the way of your participation in the class, please let us know. We promise to be understanding and to work with you. Again, our priority is your physical and emotional health.