

COURSE TITLE: ENHANCING THE MATH CLASSROOM TO ENGAGE ALL STUDENTS (K-6)
NO. OF CREDITS: 5 QUARTER CREDITS
[semester equivalent = 3.33 credits]

WA CLOCK HRS: 50
OREGON PDUs: 50
PENNSYLVANIA ACT 48: 50

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COURSE DESCRIPTION:

When your students describe math, do they say things like 'boring,' 'stressful,' and 'frustrating'? Do you wish they would say things like 'exciting,' 'interesting,' and 'engaging'? Math classes and curriculums lack in helping students make the connection between math done in the classroom and math in the real world. In her text *Becoming the Math Teacher You Wish You'd Had: Ideas and Strategies from Vibrant Classrooms*, Tracy Zager explores how to make math class more like mathematics in the real world.

Discover how big ideas such as risk-taking, mistakes, challenges, questions, reasoning, and more play a role in the math classroom. You will be surprised how easy it is to implement these strategies in the classroom, and you will see how much your students will grow as mathematicians!

This course is appropriate for educators who teach math in grades K-6.

Text: *Becoming the Math Teacher You Wish You'd Had: Ideas and Strategies from Vibrant Classrooms* by Tracy Zager. Amazon price: New: \$52

LEARNING OUTCOMES: Upon completion of this course, participants will have:

- Revisited what mathematics is, what mathematicians do, and how this applies to the classroom
- Discovered concepts, skills, and strategies that support students in developing habits of mathematicians
- Explored various examples of how to implement these concepts, skills, and strategies in the classrooms
- Learned about equity and social justice in terms of math learning
- Examined and modified math lessons based on new learning

COURSE REQUIREMENTS:

Completion of all specified assignments is required for issuance of hours or credit. The Heritage Institute does not award partial credit.

The use of artificial intelligence is not permitted. Assignment responses found to be generated by AI will not be accepted.

HOURS EARNED:

Completing the basic assignments (Section A. Information Acquisition) for this course automatically earns participants their choice of CEUs (Continuing Education Units), Washington State Clock Hours, Oregon PDUs, or Pennsylvania ACT 48 Hours. The Heritage Institute offers CEUs and is an approved provider of Washington State Clock Hours, Oregon PDUs, and Pennsylvania ACT 48 Hours.

UNIVERSITY QUARTER CREDIT INFORMATION

REQUIREMENTS FOR UNIVERSITY QUARTER CREDIT

Continuing Education Quarter credits are awarded by Antioch University Seattle (AUS). AUS requires 75% or better for credit at the 400 level and 85% or better to issue credit at the 500 level. These criteria refer both to the amount and quality of work submitted.

1. Completion of Information Acquisition assignments 30%
 2. Completion of Learning Application assignments 40%
 3. Completion of Integration Paper assignment 30%
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CREDIT/NO CREDIT (No Letter Grades or Numeric Equivalents on Transcripts)

Antioch University Seattle (AUS) Continuing Education Quarter credit is offered on a Credit/No Credit basis; neither letter grades nor numeric equivalents are on a transcript. 400 level credit is equal to a "C" or better, 500 level credit is equal to a "B" or better. This information is on the back of the transcript.

AUS Continuing Education quarter credits may or may not be accepted into degree programs. Prior to registering, determine with your district personnel, department head, or state education office the acceptability of these credits for your purpose.

ADDITIONAL COURSE INFORMATION

REQUIRED TEXT

None

None. All reading is online.

MATERIALS FEE

Becoming the Math Teacher You Wish You'd Had: Ideas and Strategies from Vibrant Classrooms by Tracy Zager. Amazon price: New: \$52

ASSIGNMENTS REQUIRED FOR HOURS OR UNIVERSITY QUARTER CREDIT

A. INFORMATION ACQUISITION

Assignments done in a course forum will show responses from all educators who have or are taking the course independently. Feel free to read and respond to others' comments.

Group participants can only view and respond to their group members in the Forum.

Assignment #1: What is Math?

Part 1

Introduction and Brief Math Autobiography

In 300+ words, introduce yourself (name, position/grade) and what led you to register for this class. Additionally, describe what math means to you, your experiences, and your history with math as a learner and/or educator.

Questions to consider in your response:

- Do you like math? Why or why not?
- What sort of math student do you think you are? Why?
- Who was your favorite math teacher? Why was that person your favorite?
- Who was your least favorite math teacher?
- Why was that person your least favorite?
- What math subjects do you like learning/teaching about, and why do you like them?
- What math subjects do you dislike and why?

Part 2:

Read Chapters 1 and 2 in the text.

Using Google, or another search engine, type in math and search under images. Review the images. In 300+ words, write about what it means to be a mathematician from the text compared to the images you see on Google. What are the images telling us about math: what it means to do math, be good at math, and who does math? How does this compare to the classroom environment?

Assignment #2: Risks and Mistakes

Read Chapters 3 and 4 in the text.

Respond to the following prompts in 200+ words each.

1. Think about the math curriculum you use with your students.

- Does your curriculum encourage mathematical risk-taking, or does it prevent/avoid it?
- How does it address student misconceptions?

2. Reread the section “Responsive Planning—Students’ Mistakes as Teachers’ Guides” on page 76.

- How would you determine when a mistake is worthwhile to discuss as a class versus handle individually?

3. What can you do to create a safe environment in the classroom, so students feel comfortable taking risks and making mistakes?

Assignment #3: Precision and Challenges

Read Chapters 5 and 6 in the text.

These two chapters contained several strategies for supporting students in being precise and helping them rise to the challenge. In 400+ words, choose 2 or 3 of those strategies that resonated with you and respond to the following prompts:

- What drew you to those strategies?
- What would these strategies do to help enhance your math time/class?
- How do you think your students would respond?
- Is there anything you would change or add to help meet the needs of your students?

Assignment #4: Questions and Connections

Read Chapters 7 and 8 in the text.

Explore the links provided by Tracy Zager on her website for Chapters 7 and 8.

Click on these links: [Chapter 7](#) [Chapter 8](#)

In 400+ words, write about what you discovered while exploring the links.

- What stood out to you?
- What would you like to bring into your classroom and why?
- What questions or wonderings do you have?
- What new insights do you have?

Assignment #5: Intuition and Reason

Read Chapters 9 and 10 in the text.

Part 1:

In 300+ words, reflect on each part of Chapter 9.

- Building Mathematical Intuition Around New Concepts (Page 212)
- Listening to Intuition During Problem Solving (Page 221)
- Strengthening Intuition with Regular Practice (Page 228)

Questions to consider in your response:

- What does this type of intuition mean in math?
- What stood out to you about the classroom examples?
- What was new to you? Confusing? Interesting? Challenging?
- How can this strategy be applied in your classroom?

Part 2:

Explore the links provided by Tracy Zager on her website for Chapter 10.

Click on this link for [Chapter 10](#)

In 200+ words, write about what you discovered while exploring the links.

- What stood out to you?
- What would you like to bring into your classroom and why?
- What questions or wonderings do you have?
- What new insights do you have?

Assignment #6: Proving and Working Alone or Together

Read Chapters 11 and 12 in the text.

Part 1:

Explore the links provided by Tracy Zager on her website for Chapter 11.

Click on this link for [Chapter 11](#)

In 200+ words, write about what you discovered while exploring the links.

- What stood out to you?
- What would you like to bring into your classroom and why?
- What questions or wonderings do you have?
- What new insights do you have?

Part 2:

In 100+ words each, reflect on the four different types of collaboration.

- Thinking partnerships
- Cross-pollination
- Math debriefs and debates
- Peer Feedback

Questions to consider in your response:

- What does this type of collaboration support in the math classroom?
- When does this type of collaboration make the most sense?
- Are you already doing some of these collaborations? If so, how do students respond?
- Ones you want to try and why?
- Are there other collaboration strategies that can work during math?
- What are the benefits?

Assignment #7: Favorable Conditions for All Students

Part 1:

- Read the following pages in the text: Read Making Mistakes and Equity (pages 77-78)
- Watch Reshma Saujani's TED Talk "[Teaching Girls Bravery, Not Perfection.](https://embed.ted.com/talks/lang/en/reshma_saujani_teach_girls_bravery_not_perfection)"
https://embed.ted.com/talks/lang/en/reshma_saujani_teach_girls_bravery_not_perfection
- Read Developing Intuition in Students Who Need It Most (pages 238-242)
- Read Intuition, Mathematical Reasoning, and Sexism (page 278)
- Read Proof and Equity (pages 307-309)
- Read chapter 13 in the text.

In 300+ words, respond to the following prompts

- What do these readings and the video make you think about?
- How might these ideas influence your teaching?
- How can educators support students in math?
- What changes in your thinking or practice would ensure that all students' ideas and thinking are valued?
- What does 'favorable conditions' for all students mean to you?

Part 2:

New Images for Math

At the beginning of the course, you searched Google for images of math. Now you get to create your own google search results based on all you've learned about real mathematics.

Using Google, or another search engine, find 8-10 images that show what math and being a mathematician now means to you. For each image, write 2-3 sentences about why you chose that image, what it means in terms of being a mathematician or doing mathematics, and how you can share that information with students in the classroom.

ADDITIONAL ASSIGNMENTS REQUIRED FOR UNIVERSITY QUARTER CREDIT

B. LEARNING APPLICATION

In this section, you will apply your learning to your professional situation. This course assumes that most participants are classroom teachers who have access to students. If you do not have a classroom available to you, please contact the instructor for course modifications. Assignments done in a course forum will show responses from all educators who have or are taking the course independently. Feel free to read and respond to others' comments. Group participants can only view and respond to their group members in the Forum.

Assignment #8: What Do Mathematicians Do?

Part 1:

Read/listen to the picture books mentioned on page 18.

For each book, in 4 or 5 sentences (or other representation - seek instructor approval first), respond to the following prompts:

- What do mathematicians do?
- What does it mean to be good at math?
- What is mathematics?
- Who is represented, and who is not represented?
- What might students see when they hear this story? What should be pointed out to them?

Do some more research about books that show what mathematicians do. Try to find 2 to 3 additional books. Write 2 to 3 sentences about each book and what you discovered about math through those books.

Part 2:

Explore the links provided by Tracy Zager on her website for Chapter 2. Click on this link for [Chapter 2](#)

In 300 + words, respond to the following prompts:

- What stood out to you?
- What would you like to bring into your classroom and why?
- What questions or wonderings do you have?
- What new insights do you have?

Do some more research to find 2 to 3 other types of media (videos, images, websites, audio recordings/podcasts, realia, speakers, etc.) that help to illustrate mathematics. Write 2 to 3 sentences about each media item you find and what you discovered about math through that media.

Assignment #9: Worksheet Makeover

Part 1:

Revisit Chapter 6 (pages 115-128)

Read some additional examples of worksheet makeovers:

- Fawn Nguyen: [When I Let Them Own the Problem](#) (middle school)
- Joe Schwartz: [Meatball Surgery](#) (elementary school)
- Joe Schwartz: [What He Said](#) (elementary school)
- Dan Meyer's [collection of makeover blogs](#) (high school)

Part 2:

Select two worksheets to do a makeover on.

You can choose the 'Flat Soda' worksheet from page 128 and/or worksheets from your curriculum (be sure to include the image in your response).

In 200+ words per worksheet, discuss the following

- What's the math here?
- Is this problem a good fit for that math or other interesting math?
- If you were going to teach this problem, how would you revise it and why? (Include the final product of your revision)
- Do you see ways to lower the threshold? Raise the ceiling? Open the middle?

Assignment #10: (500 Level ONLY) Social Justice Math

In addition to the 400-level assignments, complete the following

Part 1:

Explore [Rethinking Schools](#), [Radical Math](#), and [Mathalicious](#).

Find a lesson to try with your students (you can make modifications for the grade level as needed).

Review the lesson to see where you can add 2 strategies from the following topics:

- **Risks** (Pages 51-53 in text for ideas)
- **Mistakes** (When reviewing the lesson, look for places where students might make errors or have misconceptions. Think about how you might address those issues)
- **Precision** (How can you support students in making sense of the math and using language necessary for comprehension)
- **Challenges** (Is there an opportunity for low threshold, open middle, or high ceilings? How can you support students in productive struggles?)
- **Questions** (Does the lesson have a place for open exploration/inquiry for students to ask questions or lead students to propose a problem to solve?)
- **Connecting Ideas** (Do you need to build some background knowledge for students to access this social justice task? Maybe a video or read aloud)
- **Intuition** (See pages 212-230 in text for ideas)
- **Reasoning** (Are there patterns that students should be aware of? Can students make conjectures or claims?)
- **Proving** (Do students have an opportunity to demonstrate their thinking? Are they shown different ways to prove their thinking?)
- **Collaboration** (Pages 348-349 for ideas. How will students participate in math during your lesson?)

When you turn in this assignment, you need to have a copy of the original lesson plan and show where you added new information (can be done with different colors or sticky notes).

Part 2:

Teach the lesson. In 200+ words, respond to the following prompts:

- How did your students react to engaging with social justice issues in math class?
- Which two strategies did you use from the book?
- How did it go?
- What went well?
- What would you change and why?

Assignment #11: (500 Level ONLY) Continuing the Learning

Complete **one** of the following:

Option A) What Do Mathematicians Do? A Mini-Unit

Read Pages 17-27 in the text.

Create a Mini-Unit using information and findings from Assignment #8

- You are going to create your own mini-unit about **what mathematicians do**. Your unit plan should be 10-15 days long. Unit template examples: [example 1](#), [example 2](#), [example 3](#) or create or find your own.

In your unit, be sure to include:

- Grade level.
- Standards students will be working towards
- Unit goal(s)/objective(s) or essential question(s)
- Texts, media, and/or assignments you will complete with students each day.
- The topics presented in the text (risks, mistakes, precision, challenges, questions, connecting ideas, intuition, reasoning, proving, working together/alone).
- What activities can you incorporate that build these skills for students?

OR

Option B) Analyzing and Enhancing Math Curriculum

Part 1:

Locate your math curriculum/lessons. Choose a sequence of 3-5 lessons to work with (previously taught or upcoming lessons, whichever you prefer).

- While reading, identify if the lessons contain any of the topics presented in the text (risks, mistakes, precision, challenges, questions, connecting ideas, intuition, reasoning, proving, working together/alone).
- If you find something, make a note of it with pens or sticky notes.

Part 2:

Now it's your turn to add to these lessons!

Read through the lessons carefully again. While reading, this time, find places in the lessons to add topics and strategies presented in the text (risks, mistakes, precision, challenges, questions, connecting ideas, intuition, reasoning, proving, working together/alone).

Some ideas to consider:

- **Risks** (Pages 51-53 in text for ideas)
- **Mistakes** (When reviewing the lesson, look for places where students might make errors or have misconceptions. Think about how you might address those issues)
- **Precision** (How can you support students in making sense of the math and using language necessary for comprehension)
- **Challenges** (Is there an opportunity for low threshold, open middle, or high ceilings? How can you support students in productive struggles?)
- **Questions** (Does the lesson have a place for open exploration/inquiry for students to ask questions or lead students to propose a problem to solve?)
- **Connecting Ideas** (Do you need to build some background knowledge for students to access this social justice task? Maybe a video or read aloud)
- **Intuition** (See pages 212-230 in text for ideas)
- **Reasoning** (Are there patterns that students should be aware of? Can students make conjectures or claims?)
- **Proving** (Do students have an opportunity to prove their thinking? Are they shown different ways to prove their thinking?)
- **Collaboration** (Pages 348-349 for ideas. How will students participate in math during your lesson?)
- You should add something to your lessons from each topic. Be sure to clearly identify the topic/strategy you are adding to enhance the lesson.

Part 3:

After analyzing and enhancing the lessons, in 200+ words, write about what you discovered.

- What did you notice about the lessons?
- Was one topic identified more frequently?
- Why do you think that?
- Was there a topic or multiple topics that you couldn't identify?
- Why do you think that?
- Why did you choose to add what you added?
- Was something more challenging to add than others?

When you turn in this assignment, you must have a copy of the original lessons. Show where part 1 information and part 2 information are located (for example, part 1 is written notes, and part 2 is sticky notes).

OR

Option C) Professional Development

You have been tasked with creating a professional development session around math practices at your school for your colleagues.

Create a PowerPoint/Google slides presentation (or other representation with instructor approval) presenting the topics from the book to your colleagues.

Your presentation should include:

- Learning objectives/purpose for students?
- Minimum 5 or more of the following topics with clear examples to demonstrate strategies
- Risks
- Mistakes
- Precision
- Challenges
- Questions
- Connecting Ideas
- Intuition
- Reasoning
- Proving

- Collaboration
- An opportunity for sta? to practice or demonstrate their learning provided in the professional development

Tracy Zager's website for articles, videos, and additional links.

Use text for ideas and examples. Also, use [Tracy Zager's website](#) for articles, videos, and additional links.

Reminder: Text is important on slides but should only take up part of the slide; otherwise, participants will lose focus. Use videos or images with text to keep the message clear and concise.

OR

Option D) Another Assignment

Another assignment of your own design with the instructor's prior approval.

C. INTEGRATION PAPER

Assignment #12: (Required for 400 and 500 Level)

SELF REFLECTION & INTEGRATION PAPER

(Please do not write this paper until you've completed all of your other assignments)

Write a 400-500 word Integration Paper answering these 5 questions:

1. What did you learn vs. what you expected to learn from this course?
2. What aspects of the course were most helpful and why?
3. What further knowledge and skills in this general area do you feel you need?
4. How, when and where will you use what you have learned?
5. How and with what other school or community members might you share what you learned?

INSTRUCTOR COMMENTS ON YOUR WORK:

Instructors will comment on each assignment. If you do not hear from the instructor within a few days of posting your assignment, please get in touch with them immediately.

QUALIFICATIONS FOR TEACHING THIS COURSE:

Noor Makboul, MAT, received a Masters Degree in the Art of Teaching from Lewis and Clark College in 2014. She has also earned her ESOL endorsement and will receive her reading endorsement in 2023. She currently teaches second grade in Cornelius, Oregon. She is passionate about teaching and enjoys finding new ways to engage and challenge her students. Outside of the classroom, she loves to read, do art projects, and spend time with her family.

BIBLIOGRAPHY

ENHANCING THE MATH CLASSROOM TO ENGAGE ALL STUDENTS (K-6)

Ferlazzo, Larry. "Twelve Ways to Make Math More Culturally Responsive (Opinion)." Education Week, Education Week, 17 Dec. 2020, <https://www.edweek.org/teaching-learning/opinion-twelve-ways-to-make-math-more-culturally-responsive/2020/12>
 Fabulous article is about implementing culturally responsive practices into the classroom. Many of these strategies can also be seen in our class text.

Fosnot, Catherine Twomey. Young Mathematicians at Work: Constructing Number Sense, Addition, and Subtraction, Heinemann, 2001, paperback, 224 pages, ISBN 978-0275979058.
 Although this is an older text, Fosnot has such great problems and classroom examples to promote risk-taking, giving kids challenges and encouraging them to reason and prove their thinking. She has books that focus on fractions and decimals, multiplication and division, and algebra for elementary students. She also has individual units for primary and upper elementary that support student understanding of mathematical concepts.

Hughes, Nancy. Classroom-Ready Number Talks for Kindergarten, First and Second Grade Teachers: 1000 Interactive Activities and Strategies that Teach Number Sense and Math Facts, Ulysses Press, 2021, paperback, 216 pages, ISBN 978-1612438917.
 This is a great starting book for implementing number talks in the classroom. The book is divided into grade-level sections with short lessons that build on math facts and number sense in place value. Hughes also has number talk books for grades 3-5 and 6-8.

SanGiovanni, John J. *Daily Routines to Jump-Start Math Class, Elementary School: Engage Students, Improve Number Sense, and Practice Reasoning*, 1st Edition, Corwin, 2019, paperback, 192 pages, ISBN 978-1544374949. Fun, fast, and easy way to build number sense in the classroom! Students love the activities and they promote great conversations. This book is also available for middle school.

SanGiovanni, John J. *Mine the Gap for Mathematical Understanding, Grades K-2: Common Holes and Misconceptions and What To Do About Them*, 1st Edition, Corwin, 2016, paperback, 384 pages, ISBN 978-1506337685. This book is fabulous and aligns with so many strategies discussed in this course. SanGiovanni explores common areas where students have misconceptions and provides activities to support student understanding. This book combines instruction, assessment, and open-ended tasks that can be implemented immediately in the classroom based on student needs. This book is also available for grades 3-5.

Vierstra, Gretchen. "What Does Math Look Like in Today's Classroom?" Teaching Channel, 15 Mar. 2015, <https://www.teachingchannel.com/blog/math-todays-classroom>. Great article about what math should look like in the classroom. Simple, quick ideas to revamp the math