COURSE TITLE: **TEACHING NUMERACY: Habits To Ignite Math Thinking**

WA CLOCK HRS: **30**
OREGON PDUs: **30**
NO. OF CREDITS: **3 QUARTER CREDITS** **PENNSYLVANIA ACT 48:** **30**
[semester equivalent = 2.00 credits]

INSTRUCTOR: **Suzanne Warner**
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COURSE DESCRIPTION:
Many students lack basic numeracy – the ability to think through math problems logically, solve problems, and apply math outside the classroom. This independent study course outlines nine critical thinking habits that foster numeracy and details practical ways to incorporate these habits into your instruction. The text, *Teaching Numeracy: 9 Critical Habits to Ignite Mathematical Thinking*, refers to Common Core Standards, NCTM (National Council of Teachers of Mathematics) Standards, and numerous successful mathematical literacy practices. Included in each section is a "How Can I Do This in My Math Class…Tomorrow?" application section with multiple ideas and methods to incorporate numeracy into your classroom. No more will students arrive at wildly wrong answers and have no idea how or why!

This course is appropriate for teachers K-12.

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

- Explore the concept of numeracy and its relation to overall student success.
- Implement practical ways to incorporate numeracy habits into their classrooms.
- Transform mathematics learning from simply "doing the math" to "thinking about the math process."
- Monitor students' understanding of mathematics and mathematics vocabulary.
- Create numeracy-rich lesson plans
- Represent mathematics nonlinguistically.

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%

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
The text is Teaching Numeracy: 9 Critical Habits to Ignite Mathematical Thinking by Margie Pearse & K.M. Walton, about $20 on Amazon.

- ***Teaching Numeracy: 9 Critical Habits to Ignite Mathematical Thinking***
  ISBN# 9781412992237
  by Margie Pearse, K. M. Walton
  Corwin

  Buy from Amazon

MATERIALS FEE
Text, Teaching Numeracy: 9 Critical Habits to Ignite Mathematical Thinking, is approximately $20 on Amazon.

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: COURSE FORUM - What is Numeracy?

- Watch this video (from Australia) describing numeracy.
- https://www.youtube.com/embed/VRRGV7s3K5M?autohide=1&controls=1&showinfo=0
- ??????? Read the Introduction in *Teaching Numeracy, 9 Critical Habits to Ignite Mathematical Thinking (*published in the United States). Then in 2 - 3 paragraphs, introduce yourself, share what you hope to gain from this course, summarize and reflect on what you watched and read, focusing on your initial feelings of numeracy and the idea that it is an educational issue in multiple nations.

Feel free to respond to any other postings from educators who are also taking this course.

Assignment #2: The Nine Critical Habits

1. Read Part 1: The 9 Critical Habits to Ignite Numerate Thinking.
2. Complete the Review Questions.
3. In 500-words (or more), summarizing what you read, focusing on each of the nine critical habits. Consider the following when writing your paper:

- How does background knowledge enhance the concept of numeracy?
- What are the benefits to our students to represent mathematics non-linguistically?
- Why are highly effective questions necessary to numeracy? How does the concept of metacognition relate to this?
- What is the importance of developing a mathematical vocabulary?
- How does collaboration encourage the development of numeracy?

Assignment #3: The Five Essential Components

1. Read Part 2: The 5 Essential Components of a Numeracy-Based Mathematics Lesson.
2. Complete the Review Questions.
3. In 500-words (or more), summarizing what you read, focusing your summary on each of the five components. Consider the following when writing your paper:

- What are some key aspects of ignition?
- What is the purpose of a "Bridge to Learning?"
- How does the "gradual release" encourage numeracy?
- What is the importance of debriefing?

Assignment #4: COURSE FORUM - Numeracy and Mathematical Thinking
(1) Read the following websites:

- Developing a Classroom Culture That Supports a Problem-solving Approach to Mathematics: https://nrich.maths.org/10341
- Asking Questions and Promoting Discourse: https://www.nctm.org/Conferences-and-Professional-Development/Tips-for-Teachers/Asking-Questions-and-Promoting-Discourse/
- What is Mathematical Thinking and Why is It Important? https://www.researchgate.net/profile/Kaye_Stacey/publication/254408829_WHAT_IS_MATHEMATICAL_THINKING_AND_WHY_IS_IT_IM

(2) Write a 500-word (or more) culminating paper summarizing your conclusions from the text, videos and online readings, comparing and contrasting the text reading and online articles. In addition, consider the following in your culminating paper:

- The Developing a Classroom Culture That Supports a Problem-solving Approach to Mathematics article discusses eight aspects of the classroom. Choose one or two aspects to highlight that most represent your class(es).
- The Promoting Mathematical Thinking and Discussion with Effective Questioning Strategies article shared many type of questions to both ask and not to ask - which questions do you find yourself asking the most? Which types of questions/phrases could you try more of in your classroom?
- What are some key concepts from the article What is Mathematical Thinking and Why is It Important? Why is mathematical thinking essential for teaching mathematics?

Feel free to respond to any other postings from educators who are also taking this course.

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 #5: How Can I Do This in My Math Class…Tomorrow?
Habits 1– 8 each have a sub-section titled, “How Can I Do This in My Math Class…Tomorrow?” Implement 4 - 5 ideas in your classroom and write a 500 word (or more) paper on the ideas you chose and how the students responded to their use. Comment on how you would modify the strategy when implementing again, and why. Submit your lesson along with samples of exemplary student work (via video, photos, scans of essays etc) and include any rubric used for assessment purposes. Once your lesson is done, upload using the lesson upload function below.

Note - If you are unable to implement because of a lack of a class (e.g. substitute teacher, summertime, currently not in the classroom, etc...), feel free to either implement at home with your own children (if applicable), friends' children or create lesson plans for a future class including thoughts of what could be challenging and what you anticipate to be easy to implement.

Assignment #6: Questioning Strategies
Implement the questioning strategies that you have learned in this course for a 2-3 week period. Then, in a 500-word (or more) paper,

share:

- Your plan and strategies.
- What worked well.
- What needs improvement.
- What your next steps are to further your success.

Note - If you are unable to implement because of a lack of a class (e.g. substitute teacher, summertime, currently not in the classroom, etc...), feel free to either implement at home with your own children (if applicable) or create lesson plans for a future class including thoughts of what could be challenging and what you anticipate to be easy to implement.

Assignment #7: Mentoring
Mentor one other teacher in the methods and information from this class and observe her/him in the classroom. Write a 500-word (or more) paper summarizing your observation and results of how s/he incorporated the strategies of teaching numeracy.

Note – If you currently are not in your own classroom, you are welcome to do a different assignment, such as: interviewing 2 - 3 teachers about how they integrate numeracy into their classroom, create a blog describing numeracy and how it relates to your teaching, or you may select one of the options from Assignment #8. I am also open to any ideas you may have.

Assignment #8: (500 LEVEL ASSIGNMENT)
In addition to the 400 level assignments, complete **one** of the following:

Option A)
Create a 15-20 minute PowerPoint Presentation about Teaching Numeracy (incorporating the text and online readings) that could be used as an in-service to colleagues in your school.

OR

Option B)
Conduct research of 3-5 online periodicals, online articles or videos on mathematical thinking and numeracy. Document the key points in a mind-map or 4-page paper analyzing how your research supports and/or contradicts what you've read in the text.

OR

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

C. INTEGRATION PAPER
Assignment #9: (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:
Suzanne Warner, M.S., received her Masters Degree in Education from the University of Rochester, New York. She has taught mathematics in the middle school, high school, and college settings, most recently in Oregon. Suzanne has been lauded by administrators, colleagues, students and parents regarding her teaching and classroom management skills. Her students enjoy learning in a respectful, productive environment, where each student is in control of her/his own learning and behaviors. She strongly believes

that all students want to do well, and creates a teaching environment for them to succeed.

When not in the classroom, Suzanne enjoys spending time with her family reading, hiking, backpacking and traveling.

BIBLIOGRAPHY

TEACHING NUMERACY: Habits To Ignite Math Thinking

Boaler, Jo. *What's Math Got to Do with It? How Parents and Teachers Can Help Children Learn to Love Their Least Favorite Subject, 1st Edition*. 2009. Penguin Books, paperback, 288 pages, ISBN: 978-0143115717, In this straightforward and inspiring book, Jo Boaler, a professor of mathematics education at Stanford for nine years, outlines concrete solutions that include classroom approaches, essential strategies for students, and advice for parents. This is a must-read for anyone who is interested in the mathematical and scientific future of our country.

Humphreys, Cathy and Ruth Parker. *Making Number Talks Matter: Developing Mathematical Practices and Deepening Understanding, Grades 4-10, 1st Edition*. 2015. Stenhouse Publishing. Paperback, 200 pages, ISBN: 978-1571109989, *Making Number Talks Matter* is about the myriad decisions facing teachers as they make. Throughout the book, Cathy Humphreys and Ruth Parker offer practical ideas for using Number Talks to help students learn to reason numerically and build a solid foundation for the study of mathematics. This book will be an invaluable resource whether you are already using Number Talks or not; whether you are an elementary, middle school, high school, or college teacher.

Moynihan, Christine. *Math Sense: The Look, Sound and Feel of Effective Instruction, 1st Edition. 2012.* Stenhouse Publishers. Paperback, 144 pages, ISBN: 978-1571109422, Chris Moynihan explores some of the components that comprise the look, sound, and feel of effective teaching and learning. Does the landscape of the classroom feature such items as student work samples, a math literature collection, and a number line? Do the lessons include wait time, checks for understanding, and written feedback? Do you feel a spirit of collaboration, risk taking, and a sense of pride? *Math Sense* provides a series of self-assessment rubrics to help you identify the earmarks of a vibrant mathematics community and help you to inform refine your practice. This practical guide offers a road map for taking stock of your teaching and building a stronger mathematics classroom environment for you and your students.

Sammons, Laney, *Building Mathematical Comprehension*, 1st Edition. 2011. Shell Education. Paperback, 304 pages, ISBN: 978-1425807894, This resource applies familiar reading comprehension strategies to mathematics instruction to aid in building students' comprehension in mathematics. *Building Mathematical Comprehension* demonstrates how to facilitate student learning to build schema and make connections among concepts. It also provides clear strategies for helping students ask good questions, visualize mathematics, and synthesize their understandings. This resource is aligned to the interdisciplinary themes from the Partnership for 21st Century Skills and supports the Common Core State Standards.

Shumway, Jessica F. *Number Sense Routines: Building Numerical Literacy Every Day in Grades K-3, 1st Edition*. 2011. Stenhouse Publishers. Paperback, 192 pages, ISBN: 978-1571107909, In *Number Sense Routines*, Shumway shows that number sense can be taught to all students. Dozens of classroom examples - including conversations among students engaging in number sense routines - illustrate how the routines work, how children's number sense develops, and how to implement responsive routines. Additionally, teachers will gain a deeper understanding of the underlying big ideas, skills, and strategies that children learn as they develop numerical literacy.

Smith, Margaret Schwan and May Kay Stein, *5 Practices for Orchestrating Productive Mathematics Discussion, 1st Edition*. 2011. National Council of teachers of Mathematics. Paperback, 104 pages, ISBN: 978-0873536776, The 5 Practices framework identifies a set of instructional practices that will help teachers achieve high-demand learning objectives by using student work as the launching point for discussions in which important mathematical ideas are brought to the surface, contradictions are exposed, and understandings are developed. By giving teachers a road map of things that they can do in advance and during whole-class discussions, these practices have the potential to help teachers more effectively orchestrate discussions that are responsive to students and the disciplinef.