COURSE TITLE: **HANDS-ON MATH: Real World Applications**

WA CLOCK HRS: **30**
OREGON PDUs: **30**
PENNSYLVANIA ACT 48: **30**

NO. OF CREDITS: **3 QUARTER CREDITS**
[semester equivalent = 2.00 credits]

INSTRUCTOR: **Suzanne Warner**
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COURSE DESCRIPTION:
"When are we ever gonna use this?" is a question often asked by math students. This happens because skills are so frequently taught in isolation from their application. By participating in hands-on math activities, our students learn the connection between what is taught in the classroom and the real world. This course offers something for all teachers K-12; whether they are specialized math teachers at the high school level or elementary teachers who do it all, Hands-On Math will help students answer their own question……..."When are we ever gonna use this?" This course is appropriate for teachers K-12.

Participants will select the text most appropriate to their individual teaching levels:

- Grades K-8 teachers will use: *Math Wise! Over 100 Hands-On Activities that Promote Real Math Understanding* by Jim Overholt & Laurie Kincheloe
- Grades 6-12 teachers will use: *Hands-On Math Projects with Real-Life Applications* by Judith & Gary Meschla.???

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

- Implement hands-on math activities in their classroom.
- Broaden the scope of their mathematics curriculum to include other subjects.
- Connect mathematics learning and real world applications.
- Create an environment that supports critical thinking in mathematics.
- Encourage teamwork by students.

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
Participants will select the text most appropriate to their individual teaching levels:

- Grades K-8 teachers will use: *Math Wise! Over 100 Hands-On Activities that Promote Real Math Understanding* by Jim Overholt & Laurie Kincheloe
- Grades 6-12 teachers will use: *Hands-On Math Projects with Real-Life Applications* by Judith & Gary Meschla.???

Each text costs approximately $20-$25 (Amazon).

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MATERIALS FEE
Course texts, Participants will select the text most appropriate to their individual teaching levels: Grades K-8 teachers will use: Math Wise! Over 100 Hands-On Activities that Promote Real Math Understanding by Jim Overholt & Laurie Kincheloe Grades 6-12 teachers will use: Hands-On Math Projects with Real-Life Applications by Judith & Gary Meschla.??? costs approximately $20-$25 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 - Creating Authentic Mathematics Learning Contexts

1. Read the following article: Creating Authentic Mathematics Learning Contexts
2. Read the following artcile: How to Make Math Concepts Feel Releant to Students
3. Write a 500-word (or more) paper based on the readings, reflecting and considering the following questions:

- What is the purpose of creating authentic mathematics contexts?
- What does it mean to create authentic mathematics contexts?
- What are some authentic mathematics contexts that naturally occur in your students' environments?
- What are some considerations when creating authentic mathematics contexts?
- How does the teacher implement authentic mathematics contexts?
- How can authentic mathematics contexts help students with learning problems and/or difficulty learning mathematics?

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

Assignment #2: COURSE FORUM - Hands-on Mathematics + Multicultural Education = Student Success

1. Read the following article: Hands-on Mathematics + Multicultural Education = Student Success ???????http://www.edchange.org/multicultural/papers/math.html
2. Complete the Review Questions.
3. Write a 500-word (or more) paper based on the Hands-on Mathematics + Multicultural Education

= Student Success article. Summarize the article in addition to considering the following questions:

- What type of diversity do you generally experience in your school/classroom?
- What instructional practices advocated by the NCTM do you already implement in your classroom?
- What are your thoughts of the “shared beliefs” concepts?

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

Assignment #3: COURSE FORUM - Math is Everywhere!
Math can play an important role in understanding most any subject area, be it earth science, history, economics, geology, botany or foreign languages and cultures. Explore the following website:

- Education World's Connecting to Math in Real Life: http://www.educationworld.com/a_curr/mathchat/mathchat019.shtml
- Write a 500-word (or more) paper summarizing 3-5 lesson plans that relate to your subject matter and indicate how math is incorporated into each lesson.

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

Assignment #4: COURSE FORUM - Making Connections
Select the appropriate text for your work

If you are using *Math Wise! Over 100 Hands-On Activities that Promote Real Math Understanding* for grade K-8 teachers, review 8 - 10 different projects. Then in a 500-word (or more) paper, consider how they relate to the readings, such as how the lessons are (or are not) based in the same concepts as authentic mathematics contexts, whether multi-cultural and diversity issues are (or are not) addressed, and whether a connection to the real world is successful.

OR

If you are using *Hands-On Math Projects with Real-Life Applications for grade 6-12 teachers*, read Part 1: Implementing Projects in the Math Class as well as 3-5 different projects. Then in a 500-word (or more) paper, summarize the Part 1 reading, then consider how the lessons relate to the readings, such as how the lessons are (or are not) based in the same concepts as authentic mathematics contexts, whether multi-cultural and diversity issues are (or are not) addressed, and whether a connection to the real world is successful.

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: Implementation
Select the appropriate text for your work:

- If you are using *Math Wise! Over 100 Hands-On Activities that Promote Real Math Understanding* for grade K-8 teachers, of the 8 - 10 different projects you reviewed in Assignment 4, select and implement at least two in your classroom. In a 500-word (or more) paper, describe (for both you and your students) what went well, what challenges occurred and what you would do differently next time. Also, reflect on the experiences and if possible, compare how the mathematical understanding differed, or not, from previous times you have taught the topic.Include samples of exemplary student work (via video, photos, scans of essays etc) and include any rubric used for assessment purposes.

OR

- If you are using *Hands-On Math Projects with Real-Life Applications* for grade 6-12 teachers, of the 3-5 different projects you reviewed in Assignment 4, select and implement 2 - 3 in your classroom. In a 500-word (or more) paper, describe (for both you and your students) what went well, what challenges occurred and what you would do differently next time. Reflect on the experiences and if possible, compare how the mathematical understanding differed, or not, from previous times you have taught the topic. As part of your reflection, also compare what you read in Part 1 to your actual experience, touching on how you structured your class, cooperative problem solving, and any observation logs used as part of assessment. Include samples of exemplary student work (via video, photos, scans of essays etc) and include any rubric used for assessment purposes.

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/family's 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: Lesson Plan Creation
Create (not copy from another source, please) your own Hands-On Math Project based on your specific curriculum. Some places to look for inspiration (if needed) could be the "Challenge Problems" from your math textbook, charts/tables from any reading material, sports, Internet search of a topic, current affairs, etc…. Write a lesson incorporating your hands-on activity following the template of the activities your book. If possible, implement your lesson and hands-on activity and include a 1-2 page reflection on what went well, what did not, and what needs improvement for next time. Submit the lesson plan and hands-on math project.

You may use any lesson plan template you'd like - and are welcome to use the Heritage Lesson Plan Template.

Once your lesson is done, upload it into The Heritage Institute lesson library following the correct methods to properly classify it.

Assignment #7: Write an Online Article
Write a 500+ word article concerning any noteworthy success you've had as a teacher with one or more students in terms of hands-on mathematics and its real world applications..

• Please refer to the guidelines for our blog What Works: Teaching at its Best prior to writing your article.
• When you submit your article to your instructor, please also email a copy to Yvonne Hall
THI blog curator and media specialist.
• Indicate whether or not you are OK with having your article considered for publishing on our website.

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 Hands-On Mathematics (incorporating your text and online readings) that could be used as an in-service for colleagues in your school.

OR

Option B)
Conduct research of 3-5 online periodicals, online articles or videos on hands-on mathematics activities. 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

HANDS-ON MATH: Real World Applications

Boaler, Jo. *What's Math Got to Do with It? How Teachers and Parents Can Transform Mathematics Learning and Inspire Success, 1st Edition.* 2015. Penguin Books. Paperback, 272 pages, ISBN: 978-0143128298, A critical read for teachers and parents who want to improve children's mathematics learning. The revised edition is now updated with new research on the brain and mathematics that is revolutionizing scientists' understanding of learning and potential. Boaler presents research findings through practical ideas that can be used in classrooms and homes.

Erickon, Tim and Rose, Craig. *Get It Together: Math Problems for Groups, Grades 4-12, 1st Edition*. 1989. EQUALS/Lawrence Hall of Science. Paperback, 180 pages, ISBN: 978-0912511535, A collection of over 100 mathematics problems for groups of 26 students. The problems cover a wide range of math topics such as logic, functions, algebra, geometry, measurement, and number patterns at various levels of difficulty. Each problem has the same format: six clue cards that provide the information needed to solve a problem. Since each member of the group has a different bit of information, everyone must work together to arrive at a solution.

Muschla, Gary Robert. *Teaching the Common Core Math Standards with Hands-On Activities, Grades 6-8*, 1st Edition. 2012. Jossey-Bass. Paperback, 272 pages, ISBN: 978-1118108567, The Common Core State Standards for Mathematics were developed to help teachers give students a thorough knowledge of math at each grade level, thereby enabling them to move on to higher mathematics with competence and confidence.

Muschla, Gary Robert and Judith Muschla. *Teaching the Common Core Math Standards with Hands-On Activities, Grades 9-12, 1st Edition.* 2015. Jossey-Bass. Paperback, 312 pages, ISBN: 978-1118710104, In this book, the Muschlas extend their popular *Teaching the Common Core* series to the higher grade levels with lessons that can be quickly adapted to suit your students' ability levels and learning styles. Students will build critical thinking skills, learn how to communicate math concepts, hone problem-solving abilities, and have fun while you prepare them to excel in higher education and in the workplace.

Muschla, Judith, Gary Robert, and Erin Mushla-Berry. *Teaching the Common Core Math Standards with Hands-On Activities, Grades 3 -5, 1st Edition*. 2014. Jossey-Bass. Paperback, 304 pages, ISBN: 978-1118710333, This book is the first to provide hands-on activities specifically created to address all Common Core Standards for Grades 3-5. Brief background information on each standard, detailed instructions, and handy reproducibles make implementing these activities a breeze. Most of the activities can be done in a single class period and all are designed to capture students' attention and help them build critical thinking skills, learn how to communicate math concepts, and hone problem-solving abilities.

Shell-Gallasch, Amy. *Hands On History: A Resource for Teaching Mathematics, 1st Edition*. Mathematics Association of America. Paperback, 220 pages, ISBN: 978-0883851821, Research shows that students learn best when they actively participate in their learning. Hands-on activities, in particular, provide the greatest opportunities for gaining understanding and promoting retention. This volume is a compilation of articles from researchers and educators who use the history of mathematics to facilitate active learning in the classroom.