COURSE TITLE: **REAL WORLD MATH: Integrating STEM**

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

NO. OF CREDITS: **5 QUARTER CREDITS**
[semester equivalent = 3.33 credits]

INSTRUCTOR: **Wendi Fein**
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COURSE DESCRIPTION:
This course meets OSPI's STEM requirements.
(Formerly: MORE REAL WORLD MATH)

In the past, the teaching of mathematics has often been a skill-based, content-free experience. Yet, math is a fundamental component of much of our modern world and can be taught using real world problems, data, and examples. We see examples of real life math in business, the sciences and even when playing games and solving puzzles.

This course will take advantage of Internet resources in the use of real life math. By assessing resources on the web, we will begin to prepare a portfolio of both on-line and off-line classroom projects that can be used to teach math in your specific classroom. This course will introduce you to a vast array of ideas, many of which can be integrated into any classroom.

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

1. Improved their knowledge of math resources available on the Internet.
2. Improved their level of experience navigating the Internet and using some of the applications.
3. Expanded their knowledge of real life math applications that can be used in K-12 classrooms.
4. Gained knowledge of basic mathematical research as seen in a variety of real internet applications.
5. Developed an awareness of some of the issues and concerns associated with teaching real world math applications.
6. Added to their repertoire of mathematical instructional strategies.

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

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
None required. You will need high-speed (DSL) Internet access in order to easily view online resources.

None. All reading is online.

MATERIALS FEE
None

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: Introduce yourself
Assignment #1: Introduction of Yourself

Introduce yourself with a 250-500 word background statement:

a)Describe your current teaching situation and its relationship to mathematics education.

b)Describe the math program currently adopted in your building and the advantages and disadvantages.

c)What brings you the most joy in your work?

d)What are the greatest challenges in your situation?

e)What outcomes do you hope to achieve in taking this course?

Post your response in the online response box.

Assignment #2: Review of Internet Sites
Assignment #2: Review of Mathematics Internet Sites

Select at least three (3) of the following web sites or others of your choice, including STEM websites. List and briefly describe 15 possible projects, real life activities that you might be able to use in your classroom. Within the 15 activities, at least 3 of them must include other STEM concepts from science, engineering and/or technology..

http://archives.math.utk.edu/k12.html
This is a website of K-12 teaching materials that leads you to a plethora of additional website links. ALL LEVELS

http://mathforum.org
This is a website that has many ideas and links for hands-on activities and interactive games. ALL LEVELS

http://www.pbs.org/teachers.math
This website had many entertaining videos students could watch and then try the activities with the videos. This could be used as a technology center in a small group or a whole class activity. ALL LEVELS

https://www.ck12.org/teacher/
100% Free, Personalized Learning for Every Student Create digital classrooms, customize textbooks, and learn K-12 STEM concepts.

Include real world activities.

ALL LEVELS
http://www.estimation180.com/
Variety of lessons to build number sense and estimation skills needed at ALL LEVELS.

www.realworldmath.org
This a collection of free math activities for Google Earth designed for students and educators. In the virtual world of Google Earth, concepts and challenges can be presented in a meaningful way that portray the usefulness of the ideas. UPPER ELEMENTARY through SECONDARY

http://nlvm.usu.edu/en/nav/
This website has manipulatives and online tools for a almost every mathematical topic we teach. You may have to download JAVA to use most of the tools on this website.

ALL LEVELS
http://www.funbrain.com/
Play interactive, educational games on the web to improve your math: ELEMENTARY

https://www.desmos.com/
This site has a free graphing calculator! It also has classroom activities where you can create a class and monitor student progress/responses. Topics include equations, linear equations, inequalities, exponential, quadratics, conics, transformations and more. SECONDARY

https://www.nasa.gov/audience/foreducators/index.html
Search hundreds of resources by subject, grade level, type and keyword. These lesson plans and teaching materials support your STEM curriculum. UPPER ELEM-

STE(A)M These are links to various STEM websites to explore in more detail

https://www.wabisabilearning.com/blog/stem-resource-list-40-useful-websites

https://www.educationworld.com/a_lesson/great-stem-web-sites-students-classroom.shtml

https://www.stemfinity.com/Free-STEM-Education-Resources

https://ngl.cengage.com/assets/html/stem/ National Geographic CENGAGE

https://www.billnye.com/the-science-guy

https://fullsteam.mit.edu

https://iexplorestem.org/engineering-activities

https://www.sciencekids.co.nz

MasterMathMentor - STE(A)M - https://mastermathmentor.com/

Assignment #3: Formulate an Internet Resource List
Assignment # 3: Formulate Your Own Internet Resource List

As you can see, there are a number of very good mathematic Internet resources, both for students and teachers. Please gather an additional 6-8 Internet resources that are appropriate for your classes. Of these resources, please include at least 2-3 that incorporate STEM skills from science, technology and/or engineering in addition to math skills.

Write a 250+ word summary of the sites, responding to the following items:

a)a list of recommended resources, including at least 2 STEM resources,: list appropriate levels, why the site is of value

b)resources not recommended and why

c) summarize the usefulness of the assignment in 1-2 paragraphs.

Assignment #4: Applied Math/STEM Research
Assignment # 4: Applied Real World Math/STEM Research

It is important for participants to be introduced to applied (or real world) math research on the Internet as well as in their own school

district. Complete BOTH Parts A and B of this assignment.

Part A. Research 3 articles/websites on the Internet or other resources to find articles on applied or real world math, **including at least one STEM article,** relevant to your teaching situation. Summarize your findings in a thoughtful 250+ word paper.

Part B. Applied/Real World/STEM math in your school/district: Evaluate texts being used for applied or real world math applications as well as STEM/STEAM in terms of relevancy to your grade level.
Determine where your school/district is heading philosophically toward real life and applied math as well as STEM/STEAM and find out about the programs at the elementary/secondary school level.
At the secondary school level, what students enroll and what is their success rate?
Summarize your finding in a 1-2 page paper, noting areas that are successful and what needs improvement.

This completes the assignments required for Washington Clock Hours, Oregon PDUs, or CEUs.
Continue to the next section for additional assignments required for University Quarter Credit

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: Short Term Curriculum Project
(Required for 400 and 500 Level)

Develop a math curriculum project that could be conducted in a short period of time (2-3 class sessions). This project should maximize the use of Internet resources and emphasize the application of a mathematical concept or skill in the real world, integrating curriculum into at least 2 other STEM subject areas: science, technology and/or engineering

Use the following lesson plan template:

Lesson Plan Design
Title Enter Lesson Plan Title, and your name
Audience Enter grade level (& special student group if applicable)
Time duration Enter time duration of the entire lesson
Big Idea(s)/Essential Question(s)
Enter learning goal(s) in the form of a question(s)
Objectives(s) Enter Your Objective(s) and correlation to district standards (state,Common Core, other)
Props & Materials Enter props/materials/equipment/any learning handouts
Activities/Tasks/Procedures
Any Special Reminders
Enter activities/tasks/procedures/practice
Enter anything you want to remember to pay attention to
Peer Review Enter peer relationship to you and summary of peer comments

Assignment # 5-A:

- Implement at least 1 lesson with students in your classroom.
- Write a 250-500 word commentary on what worked well and what could be improved.
- Include any student feedback or noteworthy student products.
- Submit a project description and your lessons to your instructor via the lesson tab below.
- Share what you've learned with other teachers taking our courses by checking the lesson library box when you submit your lesson.

OR

Assignment #5-B:

Use this option if you do not have a classroom available.

- Develop your project. (Do not implement it.)
- Write a 500+ word article concerning any noteworthy success you've had as a teacher with one or more students.
- 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 Rebecca Blankinship THI blog curator and media specialist.
- Indicate whether or not you are OK with having your article considered for publishing on our website.
- Submit your article to your instructor via Response field and the modified lesson via Submit Lesson.
- As you submit your lesson, consider sharing it with other teachers taking our courses by checking the lesson library box.

Assignment #6: Long Term Online Curriculum Project
Develop a math curriculum project that could be conducted in a longer period of time (5-8 class sessions). This project should maximize the use of Internet resources and emphasize the application of a mathematical concept or skill in the real world, integrating curriculum into at least 2 other STEM related subject areas: science, technology and/or engineering.

PLEASE USE A DIFFERENT SKILL AREA THAN YOUR SHORT TERM PROJECT.

Lesson Plan Design
Lesson Plan Title, and your name
Audience Enter grade level (& special student group if applicable)
Enter time duration of the entire lesson
Big Idea(s)/Essential Question(s)
Enter learning goal(s) in the form of a question(s)
Objectives(s) Enter Your Objective(s) and correlation to district standards (state,Common Core, other)
Props & Materials Enter props/materials/equipment/any learning handouts
Activities/Tasks/Procedures
Any Special Reminders
Enter activities/tasks/procedures/practice
Enter anything you want to remember to pay attention to
Peer Review Enter peer relationship to you and summary of peer comments

Teach the lesson to your class and then write a 2-3 page summary describing:

a)The overall project

b)The objectives, procedures, evaluation methods

c)Its effectiveness with your class and changes you would make

Assignment #7: Evaluation of Internet Websites
You have reviewed several internet websites related to real world math/STEM. In 500+ words, answer the following:

a) How can the sites be used in your classroom as a supplement to your curriculum?

b What are the advantages and disadvantages to the use of the internet?

c) How can the sites be used to further STEM skills in the classroom?

Assignment #8: Assignment 8: (500 Level ONLY)
Choose ONE of the following

a)Visit another math class using real life/applied math philosophies in your region and sit in on one or more classes that interest you. Write a 1-2 page report on the highlights of your visit and what you found that was personally useful.

OR

b)Create a PowerPoint presentation for your staff based on this course and focused on perspectives or strategies you feel would be beneficial for your school. Save this as a pdf.

OR

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:
Wendi Fein, M.A., enthusiastically brings her years of teaching experiences since 1980 to the development and implementation of her courses. Presently, she is teaching Adult Education, Developmental Math and English as a Second Language at Tacoma Community College in Tacoma Washington.

She spent 25 years teaching in K-12 public schools with a focus on special education, math, dance, PE, study skills and English/World Cultures. In addition, Wendi has traveled and volunteered extensively, bringing her stories and passion for human rights and equity into the classroom. Wendi holds a B.A. from the University of California, Santa Barbara and an M.A. in Special Education.

BIBLIOGRAPHY

REAL WORLD MATH: Integrating STEM

SELECTED BIBLIOGRAPHY

WEBSITES: CURRICULUM- INTERACTIVE PROJECTS FOR STUDENTS, TEACHERS, PARENTS

http://teams.lacoe.edu/documentation/projects/projects.html#other-current A variety of K-12 cross curricular projects that link students to other parts of the country and the world. FOR EXAMPLE:

http://teams.lacoe.edu/documentation/projects/math/20tosses/coin96.html Toss a coin twenty times, and compare your class results with other schools across the United States.

http://www.cyberbee.com/weatherwatch/ Students in different climatic zones exchange specific weather information which is posted on the World Weather Watch Automated Results page so teachers and students can do global comparisons.

http://library.thinkquest.org/TQ0312134/ This site is designed to help you learn in a fun way. We've made problems that are not only challenging but fun. We also have different resources to help you with your work. We have 3 fun games for different levels of math.

http://www.nationalmathtrail.org/ Participate in the National Math Trail by helping your students discover math in the world around them by creating math problems about what they see and what they want to know.

http://archives.math.utk.edu/k12.html - For teachers grades K - 12

Different links to different mathematical sites. Lesson plans and links to lesson plans on many different topics can be found here. It's nice if you are searching for a specific topic.

http://mathforum.org/ - "the Math Forum at Drexel" This site is good for anyone, all ages, teachers, parents. The problems change from week to week and they are made especially for middle school students. You can compare your answers with students across the country or work with others in your class. It has Ask Dr. Math where you can get help with your homework. It has lesson plans, projects, web compilations and other items that are helpful to teachers.

http://www.pbs.org/teachers/math/ As with all PBS site this is nothing but quality, a must see and use! Lovely videos to use as introduction to math applications, but the videos are not about math, but about science and engineering in broad terms, without specifically focusing on "how is math used to do such and such"

PROFESSIONAL DEVELOPMENT/CURRICULUM REFORM.

http://www2.edc.org/mcc/pubs/mbiblio.asp This publication is an annotated bibliography of articles relevant to Standards-based mathematics curriculum reform. It is intended for educators and communities considering the selection or implementation of Standards-based mathematics instructional materials. It may also be helpful to individuals interested in learning more about the challenges of and effective practices for using Standards-based programs in mathematics.

http://www2.edc.org/mcc/default.asp The K–12 Mathematics Curriculum Center aims to help teachers and administrators make thoughtful, informed decisions about mathematics curriculum and instructional materials. Our projects explore and analyze how curriculum decisions are made in K–12 mathematics programs, provide resources that support good curriculum selection and implementation, and connect research and practice in mathematics instruction.

http://www2.edc.org/mcc/pubs/mperspectives.asp Perspectives on Curricular Change is a collection of edited interviews with users of 12 National Science Foundation-funded, comprehensive mathematics curricula. Three books make up the series, providing perspectives from teachers, administrators, and developers at the elementary, middle, and high school levels. Perspectives on Curricular Change aims to provide readers with a better understanding of the ways in which Standards-based curricula differ from traditional textbooks, and to offer a glimpse into the experiences of real people who have implemented these programs.

http://standards.nctm.org/ Links to the National Council of Teachers of Mathematics standards.