

MATHEMATICS ACROSS THE CURRICULUM – A STRATEGY FOR QUANTITATIVE LITERACY

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OUR BACKGROUND IN MATH ACROSS THE CURRICULUM

- Edmonds CC College-Wide Ability: Quantitative Skills (1997)



- NSF Grant: “Mathematics Across the Curriculum (MAC)” NSF CCLI Adaptation & Implementation (2000-2004)



- NSF National Dissemination Grant (2005-2009)





Complete the following statement: (think, pair, share...)

- A quantitatively literate student should be able to . . .



PHILOSOPHY OF MOUNT SI HIGH SCHOOL



- We also recognize the importance of a variety of learning experiences. Fostered by a diverse, **integrated curriculum**, we strive to enable students to identify and realize their potential, to celebrate individual differences, to develop skills and motivation for lifelong learning, and to be **knowledgeable, responsible and productive citizens**.





- **Mathematics Department Mission Statement**

“Our goal is to create a mathematically literate student.”



MATHEMATICAL LITERACY IS DEFINED AS:

“An individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen.”

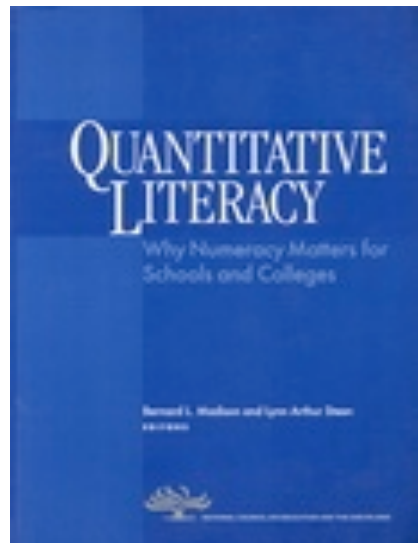
- *Programme for International Student Assessment* (PISA, 2000)



WHOSE RESPONSIBILITY?

- “Quantitative Literacy, the ability to use numbers and data analysis in everyday life, is everybody's orphan. Despite every person's need for QL, in the discipline-dominated K-16 education system in the United States, **there is neither an academic home nor an administrative promoter for this critical competency.**”

Quantitative Literacy



WHOSE RESPONSIBILITY?

- “Quantitative literacy is more about habits of mind than specific mathematical content. **Therefore, the responsibility for developing quantitative literacy, like writing across the curriculum, is shared by the entire college faculty.** However, mathematics faculty should lead the quantitative literacy movement by helping to establish a set of outcomes expected of students in each program.”

- - *AMATYC Beyond Crossroads*





- **School-wide Mission Statement ???**

Our goal is to create a **quantitatively** literate student.



A NOTE ON WORDING...

- “The capacity to deal effectively with quantitative aspects of life is referred to by **many different names**, among them **quantitative literacy**, **numeracy**, **mathematical literacy**, **quantitative reasoning**, or **sometimes just plain ‘mathematics’**.”

Mathematics and Democracy



WHO SAYS WE NEED QL?

- NCTM Standards:
 - Connections Standard
 - “Recognize and apply mathematics in contexts outside of mathematics.”
- EALRs & GLEs:
 - “The student understands how mathematical ideas connect within mathematics, to other subject areas, and to real-world situations.”
- Mt. Si HS Math School Improvement Plan
 - Rational: “Math WASL results show need for improvement; Demonstrated need to enhance math comprehension of all students;”
 - Activity: “...assist all departments in intentionally integrating math concepts into their existing lesson plans.”



A decorative graphic on the left side of the slide. It features several vertical lines of varying heights and widths in shades of light orange and pink. Overlaid on these lines are five solid orange circles of different sizes, arranged in a cluster that tapers towards the bottom left.

EXAMPLES OF MATH ACROSS THE CURRICULUM PROJECTS

MAC³ DISCIPLINES - WWW.MAC3.AMATYC.ORG

Accounting
Anthropology
Art
Art History
Biology
Business
Career & Technical
Campus-Wide Initiatives
Chemistry
Computer Information Systems
Computer Science
Economics
Education
English
Environmental Science
Ethnic Studies
Ethnomathematics
Geology

Health
Health & Human Services
History
Humanities
Labor Studies
Mathematics
Nursing
Physics
Policy Studies
Political Science
Psychology
Reading
Sociology
Spanish
Speech
Special Education
Statistics and Data Analysis
Study Skills
Urban Planning



WHAT CAN MAC LOOK LIKE?

Modes of Integration:

- Projects within a Course
- Linked Assignments
- Entire Courses
- Learning Communities
- Service Learning Projects
- Department Wide Projects
- Institution Wide Projects



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WHAT CAN MAC LOOK LIKE?

○ **Examples of projects:**

- Art – Design or Ceramics
- English - Composition or Journalism
- Sciences – Chemistry or Biology
- Vocational/Technical – Construction Tech
- PE/Health - Health
- Foreign Language - Spanish
- Social Studies- Ethnomathematics



ART (DESIGN) COURSE

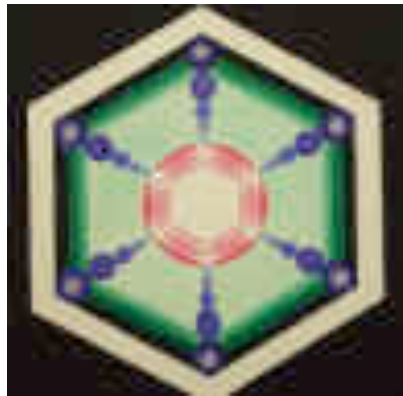
- Project in *Two-Dimensional Design* course
- 5 CR Art course – no math “credit”
- Math instructor guest lectured on Regular Polygons & Tessellations
- Instructor found that incorporation of geometric figures gave students form and structure



EXAMPLES OF STUDENT WORK

—

ART DESIGN COURSE



ART: CERAMICS

- Started as a non-credit integration when they developed ceramics projects in Geometry course for future teachers
 - Ceramic vase project
 - Tiles





ART: CERAMICS

- Combined Ceramics & 1 CR Math
 - **Measurement activities**
 - **Ratio/proportion**
 - Scavenger hunt
 - Symmetry patterns
 - Ethnomathematics
 - Unique surfaces



ART: CERAMICS

- Combined Ceramics & 1 CR Math – Fall 2006
 - Measurement activities
 - Ratio/proportion
 - **Scavenger hunt**
 - **Symmetry patterns**
 - Ethnomathematics
 - Unique surfaces



OTHER IDEAS FOR FINE ARTS

- Photography – dimensions, ratios
- Drawing – perspective, ratios, constructions



Math and Writing

Beginning Algebra/English 101

- Comparison/Contrast papers: students performed a taste test between two products
- Concept Maps
- Summary Statements
- Boolean Logic for library searches



Math and Writing

Beginning Algebra/Reading

- Pre-reading assignments for technical reading
- Concept mapping
- Application Problem/Poem assignments
- Reading for Content



BIOLOGY WITH MATH-AID

- Combined Biology 201 (5-credits) with Topics in Math (2-credits).
 - Knowledge of math content used in assignments and labs



BIOLOGY WITH MATH-AID

Math topic	Biology examples
Graphing	Photosynthesis Enzymatic reactions
Units & Scientific Notation	liter, ml, μ meter, mm, μ m ...
Logarithms & exponential functions	pH, electrophoresis, bacterial growth
Probability & Genetics	Mendelian genetics
"DNA math"	restriction maps, electrophoresis



Vocational / Technical Courses

- Melanie Breitbach & Greg Meyers
- Construction Tech and Math



Careers in construction start in today's classrooms.

Today's construction industry needs thousands of highly trained technicians to get through the next 10 years. That's why the AGC Education Foundation supports efforts like AGC's High School Construction Industry Program. When students ask the inevitable "Why do I need to learn this?" question, like Greg Meyers (second from left), they get the real-world construction examples of skilled laborers. And he can help them understand how they can prepare for their knowledge when they complete high school.

A well-trained workforce ensures a high quality of construction. AGC Education Foundation and AGC Education Foundation are working with educators to ensure that Washington's construction workforce will be the best trained in the U.S. & we make opportunities for students to learn more about www.agceducation.org.

AGC Education Foundation
AGC Associated General Contractors of America
1-800-562-2668
www.agcna.com

Working together to build the workforce of tomorrow.

HEALTH

(MOUNTLAKE TERRACE HIGH SCHOOL)

- Lessons on Survey Design, Graphing, and Statistics
 - Learn to effectively assess the statistics in current media by developing critical thinking skills with the data.
 - Learn how to design and administer valid surveys.
 - Learn how to perform simple statistical analyses. The data used will be on drugs, alcohol and sexual health for potential adolescent behavior modification.
 - Learn how to make good graphs.



SPANISH

- Doing math (arithmetic or algebra) in Spanish
 - Learn words for numbers without sequence
- Completing quantitative projects in Spanish class (with directions given in Spanish)
 - Converting units (metric)
 - Geographically-appropriate business project
- Comparing math structure with language structure
 - Similarities in rules



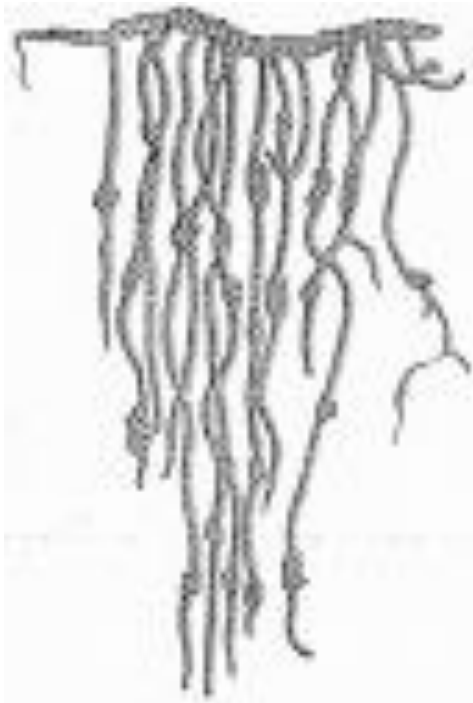
ETHNOMATHEMATICS

- Buildings
- Land Measurement
- Agriculture



ETHNOMATHEMATICS

- Quipu project



QUESTIONS FOR BRAINSTORMING – Yellow WORKSHEET

- Break into groups (by department)
with math “mentor”



QUESTIONS FOR BRAINSTORMING - WORKSHEET

1. First, brainstorm about the quantitative aspects or elements of your course/discipline. If needed, consider the following questions about the classes you teach. What can you quantify? What could you represent graphically or visually? What can you measure? List as many as you can think of.



QUESTIONS FOR BRAINSTORMING - WORKSHEET

2. From the list you created in #1, choose one specific quantitative aspect on which you can create an assignment to implement in at least one course you teach this Fall semester. Your assignment might add new content or it may simply deepen the quantitative reasoning you already teach.



QUESTIONS FOR BRAINSTORMING - WORKSHEET

3. Articulate the learning objective(s) you have for your students that you will address with this lesson or assignment you made in #2.
4. Referring back to the list you made in #1, what other lesson or assignment(s) could you create to implement during Spring semester that will deepen or extend the quantitative reasoning elements?
5. In one or two sentences write a description of your project. This information will be shared with the large group during the reporting out time.



Report Out

- Please have one person from your group give a 1-2 sentence summary of your project.



Return to Groups – do pink worksheet

- Include a timeline or dates with your Tasks listed in question #1
- Note any challenges or obstacles that arise in your group discussions – we will talk about these later.



WEB LINKS to Resources

- MAC³ Projects and Courses
 - <http://www.mac3.amatyc.org/projects.htm>
- Dartmouth College Electronic Bookshelf
 - <http://www.math.dartmouth.edu/~mqed/index.html>
- Statistical Literacy
 - <http://www.statlit.org/>
- Social Science Data Analysis Network
 - <http://www.ssdan.net/chip/exercises.shtml>
- Mathematical Association of America SIGMAA-QL
 - <http://www.maa.org/QL/>
- National Numeracy Network
 - <http://serc.carleton.edu/nnn/>



THANK YOU!
YOU CAN CONTACT US AT:

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