Introducing Spreadsheets across the Curriculum Len Vacher, University of South Florida



NSF DUE-0126500 (5/15/02 - 4/30/03)

Modules for geological -Mathematical problem solving. Proof of concept.

NSF DUE-0442629 (7/05 - 6/08)

Spreadsheets across the Curriculum. Full Development.



Where I'm coming from.

A WORLD AWASH IN NUMBERS!

2001-2020-2011

QL: A habit of mind in which one engages numbers in everyday context.

803 809 521 523 541 547

907 911 915 981 1061 1063 1069 967 971 91 1039 1049 1051 1061 1063 1069 1067 971 91 463 1171 1181 1187 1183 1067 1091

51 1153 1703 83 1289 1291 1297 1301 1303 1307 1319 1321 1321 1327 13 83 1289 1291 1481 1483 1487 1489 1493 1400 4844 1361 1367 1 9 1283 1285 1471 1481 1483 1487 1489 1493 1493 1499 1511 1327 1381 1387 12 1453 1459 1471 1481 1483 1487 1657 1663 1667 1669 1511 1523 1531

033 1034 100 1171 1181 1187 1103 1087 \$1 1153 1163 1171 1181 1187 1193 1204 \$1 1153 1204 1907 1201 1201 1201 1201

73 1751 1993 1997 999 2003 2011 2017 2027 2029 2039 2053 1997 1993 1997 999 2003 2011 2017 2027 2029 2039 2053 79 1987 1987 1987 2039 2007 2213 2221 2237 2239 2243 2251 2267 2289 2053 200 9161 2179 2203 2207 2213 2221 2237 2239 2243 2243 2251 2267 2289 2213

1609 1613 16191621 1627 1637 1657 1663 1667

1607 1000 10801 811 1823 1831 1847 1861 1867 1669 1783 1787 1789 1801 801 801 801 1867 187

643 647 653 059 661 673 677

797 809 811 821

443 449 457

031709 1117 1123 1013 1019



Math phobia Math anxiety Math avoidance

Numeracy

Network

Barbara J. Tewskbury, R. Heather Macdonmald, Cathryn A. Manduca, and David W. Mogk, 2004: On the Cutting Edge: Improving Faculty Ability to Design Innovative Courses.

The process begins, not with a list of content items, but with setting goals by answering the question, "<u>What do I want my students to be</u> <u>able to do on their own when they are done</u> <u>with my class?</u>", rather than the question, "<u>What do I want my students to know in this</u> <u>subject?</u>"

NSF and AAAS, Invention and Impact: Building Excellence in Undergraduate Science, Technology, Engineering and Mathematics, A Conference of the Course, Curriculum and Laboratory Improvement (CCLI) Progam, April 16-18, 2004, Crystal City, Virginia., p. 39.

What do I want my students to be able to do on their own when they are done with my class?

Solve problems.

Polya.

Our knowledge about any subject consists of *information* and of *knowhow*. If you have genuine *bona fide* experience of mathematical work on any level, elementary or advanced, there will be no doubt in your mind that, in mather Polya's heuristic than mere possession c 1. Understanding the problem. What is know-how in 2. Designing a plan. not merely routine egree 3. Carrying out the plan. of independence, j A problem is a 'grea **4. Looking back.** problem if it is just a little difficult. Yet some degree of difficulty belongs to the very notion of a problem: where there is no difficulty, there is no problem. (p. 117)

Mathematical Discovery: On Understanding Learning, and Teaching Problem Solving (Wiley, v. 1, 1962, 216 pp; v. 2, 1965, 191 pp.

My Course: Computational Geology

Purpose: To solve (geologic) problems (not exercises) with quantitative content.

- 15-25 students.
- Late Juniors, early Seniors.
- Capstone for required math for the major (one year of calculus).
- Non lecture
 - Each class: A "How to Solve It" session
 - "Just in time teaching"
 - Target: Leave with plan to build a spreadsheet to solve problem
 - Homework: work through module on course Website
 - Hand in selected "End-of-module questions"
- Term project: Groups make and present a SS module.

Rules/Tips for Modules

Teach the math, not the context.*

Remember, 13-16 slides. Target for 15.

Include one or more slides that preview the module.

Pose the problem.

Build the spreadsheet in successive slides.

End with "end-of-module questions."

Create metadata for cataloging and access.

Rules/Tips for Modules

Expect that whatever you think will be in one module will take 3-4 modules.

Do not expect that your students will have mastered unit conversions.

Repetition is a good thing.

Tip from his students \rightarrow Small Steps, All Steps. (Reinforce the problem solving process!)