Broadening Pathways: Teaching Math Lit Online

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AMATYC 2017
• Can/should every math class be taught online?
• To what degree should an online class mimic the experience of the corresponding face-to-face class?
• What features are essential to an online math class?
• Provide flexibility for students
• Satisfy administrator requests and/or requirements
• Grow online offerings

Why teach Math Lit online?
• Create a similar experience as the face-to-face class
  • Promote engagement and student interaction
  • Keep the focus on problem solving
  • Help students with math and student success components of course

• Maintain the F2F pass rate if possible

Our goals of teaching Math Lit online
Introduce unit and focus problem to frame unit

Teach each section of content
  • Explore, Discover, Connect, Reflect
  • Homework (online system only or with book)

Use group work and problem solving
  • Each class period
  • Focus problems
  • Sometimes for quizzes
  • Homework

Use Excel
  • Demonstrate during some sections
  • Focus problems

Focus Problems
  • Work with group on them periodically
  • Debrief solution

Assess understanding and work
  • Grade online and book homework
  • Quizzes, tests, and focus problems
Online Approach

Introducing the course structure and cycle

Explain to students the activities of learning and the order for each

Intro video

- Unit goals
- Focus problem
- Tips
- Topics to cover
Online Approach

Starting a section: Explore

Students try exploration problem on their own using the book to work on problem solving and set the stage for the section

They post results on the discussion board (1 per section) and interact with other students

Discussion board (in MML) uses “post first” feature so students have to submit something before seeing other responses

Respond to each student and to each other to continue working on problem throughout week

Post answer and explanation at end of the week
Lance
RE: Possible solution
8/26/2016 3:36:21 PM

I think I've figured out that the number has to be 1_ _ _ .362 with the blank spaces being one of the following combinations: 2,2,2 1,4,1 1,2,3
If we use as the one additional description that the nu

Instructor Almy reply to Lance Meyer
RE: Possible solution
8/26/2016 7:36:15 PM

Fantastic! Can you list all the numbers that would qualify? Also, the first digit doesn't necessarily have to be 1. You could have 2211.362 and meet all the conditions.

Lance reply to Instructor Almy
RE: Possible solution
8/26/2016 10:34:52 PM

I thought I had? Im pretty sure that 362 are the only options for those place values, and I listed what I thought were all the options for the rest of the numbers. Although, even though I KNEW I could

Taisha reply to Lance Meyer
RE: Possible solution
8/26/2016 9:27:03 PM

Hi Lance. You are on to something here... but the 1222.362 adds up to 18 instead of 17. If your rule of ones, tens and hundreds place would be implemented, then would the appropriate answer be instead

Instructor Almy reply to Taisha Moline
RE: Possible solution
8/28/2016 2:35:46 PM

Yes, one of those first 3 two's needs to be a 1. 3111.362 also works.
SUCCESSES:
• Almost mimicked F2F experience
• Students and I interacted on content and problem solving

CHALLENGES:
• Basically an individual interaction
• Large workload to do one 4 – 5 per week
  • Made some extra credit
  • Made them due weekly instead of daily
• Students did Explores at end of week and used technique from section
Work through main content of section using book and ebook for supplemental videos (alone since relying on student interaction would take too long)

Work numbered problems checking answers with answer document provided

Collect a sample of 5 pages each week for a completion grade to keep students accountable and working through content

Grade pages using grading features of LMS and provide comments
Consider the following Nutrition Facts for Junior Mints candies. Use the information on the label to answer the questions, including units in your work and final answers. Keep in mind that nutrition labels tend to list approximate values, and percents are usually rounded to whole numbers.

1. What percent of the calories in Junior Mints is from fat?

\[
\frac{17.6}{1870} \times 100 \approx 0.95\%
\]

2. This package of Junior Mints accounts for 5% of a person’s daily intake of fat for a 2,000-calorie diet. How was that number calculated?

By taking total fat in serving, which is 6.5g, and multiplying by 30, 65g total intake.

3. What percent of a person’s daily allowance of carbohydrates does she consume if she eats this whole package of Junior Mints? Find the answer on the label and show how to calculate it, assuming a 2,000 calorie diet.

\[
\frac{11.666\%}{1270} \times 100 \approx 8.33\%
\]

4. Find the number of calories per piece of Junior Mint candy if there are 16 pieces in a package.
SUCCESSES:
• When students did the pages, they got the theory and needed skills
• The content made more sense to students
• I could get them feedback on their work and see where there were issues
• Frustration reduced for everyone and my connection to students increased

CHALLENGES:
• Students used the answers as they worked the problems
• Some students skipped the pages until I started grading them – led to confusion on homework
• Some students only did the 5 pages I collected at the end of the week when they were posted
Work problems alone and check answers with answer doc

Not ideal process but needed to save time and manage the workload
**SUCCESSES:**
- When students did the pages, they got to use the skills they learned and improve their problem solving abilities

**CHALLENGES:**
- Students used the answers as they worked the problems
- Students weren’t interacting on challenging problems with me or each other
Online Approach

Homework

All completed in online system
- Skill-based exercises
- Some more contextual homework like problems in book
- Created some custom questions

No book homework to keep workload manageable and provide students with more feedback
SUCCESSES:
• Students did the work daily
• Homework scores were good

CHALLENGES:
• Students weren’t getting as much problem solving since fewer book hw problems used (compensated with book work they already did)
• Homework was easier than what F2F students had
Provide overview, intro video, tips, and work structure

Use campus LMS to work with a group
  • Students can join a group
  • Have their own group discussion board that’s visible to me
  • Use Collaborate/Conferences or Google docs/hangout

Provide regular work session reminders

Test question for accountability
Cycle 1 Focus Problem

Each cycle has a focus problem, which is an involved problem that will be solved throughout the cycle in groups. The focus problem (fp) will use many of the concepts learned in the cycle and put them into action in an authentic problem.

To make this process manageable, we will have several work sessions where you will complete certain tasks. Scroll down to read more.

FP Work Session #1:

1. Read the focus problem.

Read all of Section 1.1 (pages 3 and 4) in the physical book. Underline every question or statement that gives an instruction of something you should do. For example, underline this sentence in the 6th paragraph on page 3: "Convert this amount to something practical to make sense of the size of the spill."

2. Join a group.

Click People at the left and then choose the Groups tab. Click Join next to a Cycle 1 FP Group that has an opening.

Each group will have its own ways of communicating and working together that the other groups will not have access to.

3. Work with your group members to get a plan.

Points: 25

Submitting: a file upload
Maximum penalty $31,424,400,000 (87 days x 84,000 barrels per day x $4.30 per barrel) gallons lost 306,936,000 (87 days x 84,000 barrels x 42 gallons per barrel). The current value of the oil is $341,722,090 (54.76 current price of oil per barrel x 7,300,000 barrels of oil). Value of oil at the time of spill $596,592,040.00 ($81.63 per barrel x 7,306,000 barrels of oil). 

Minimum penalty $5,359,200,000 (87 days x 56,000 barrels per day x $1.10 per barrel) gallons lost 204,524,000 (87 days x 56,000 barrels x 42 gallons per barrel) which is currently worth $227,014,720 (46.76 current price of oil per barrel x 4,872,000 barrels of oil) Value of oil at the time of spill $397,701,360.00 ($81.63 per barrel x 4,872,000 barrels of oil). 

59.5% of maximum penalty (18,700,000,000/31,424,400,000).

The final amount is closer to the maximum.

885.9 cubic feet per second — 51954 cubic feet per minute — 3,117,240 cubic feet per hour (51954 ~ 3ft x 60 minutes) (number ~ 3ft = cubic feet) = 74,813,760 cubic feet per day (3,117,240 ~ 3ft x 24 hours) Total loss 6,508,797,120 cubic feet (74,813,760 ~ 3ft x 87 days).

A Comparison of the BP Oil spill of 2010 to the Exxon Valdez Oil spill of 1989. Until the BP oil spill the Exxon oil spill was considered the largest oil spill in US waters. The Valdez spilled 11.38 million gallons of crude oil off the coast of Prince William Sound Alaska. In comparison, the BP oil spill leaked an estimated 210 million gallons of oil in the Gulf of Mexico. There were no deaths reported in the Valdez spill, but for the BP oil spill there were 11 people reported missing and never found. Twenty five years after the Valdez Oil spill there is still contamination to the area around Prince William Sound, some of the species of animals have been able to come back, but some of them have not. 

There is a concern that some of the Orca Whale population will not be able to come back from the spill. The BP oil spill is also affecting the Dolphin population in the Gulf of Mexico as they are being born with under developed lungs and not surviving.
Online Approach

Focus Problems

SUCCESSES:
• Almost mimicked F2F experience
• Students got to know each other

CHALLENGES:
• Very difficult to get together with group
• Some students slacked
• Students waited too long to work on problem
Online Approach

Assessment

Discussion boards

Book work each week

Homework in online system

Quizzes in online system

Practice test in online system
(skills and concepts/application)

Actual test in online system—proctored
(skills and concepts/application)

Focus problems
Complex course

- Lots to keep track of
- Used 2 online platforms
- Big workload
- Lots of communication (DB, announcements almost daily)
- Hard to balance workload with consistency students want

Some student attitudes

- Lack of buy-in from one
- Negative attitudes are contagious
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<th>Discussions</th>
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Experience
• Most challenging online course I've ever made or taught
• Most rewarding one too
• Strong connection to all students and between students
• Large workload for everyone (students and me)

Results
• Lost some sooner but core group stayed
• Pass rate is comparable to F2F or a little higher
Next time: Many changes

- May add a synchronous component (via webinar or Canvas Conferences)
  - Introduction to course
  - Group work
  - Big picture items (cycle goal, focus problems) to make content cohesive
  - Count sessions for points to encourage attendance
- Use more features of LMS
- Try to get into one online system
- Change discussions to Connect, not Explore
  - 1 required and 1 extra credit discussion per week
- Video for each Explore and section overview
- FP individually instead of with a group and do fewer of them (No FP this time)
- Spell out all due dates including discussions on syllabus
Questions?
For More Information

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http://almydoesmath.blogspot.com

NEW: Math Lit instructor forum