



A Study on Infusing QL in an Online College Algebra Course

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Background (QL at Appalachian)

QL is a 4-hour gen-ed requirement

As part of Appalachian's master's program, about 6-7 graduate students teach college algebra each semester
Pro: Teaching experience
Cons: First-time teachers typically stick to lecture/exam format
Fair to students?

U.S. Bachelor's Degrees Conferred, 2012



Math or Statistics

- Engineering, Computer Science, Physical Sciences
- Other

Is Appalachian Alone?

et...

In a 2010 AMS survey of programs...

 65% still used a traditional approach in college algebra (same as in 1990)

College algebra remains the most heavily enrolled introductory course Minimal lecture
Contextualized activities
"Alternative" Assessment
Problem-based learning

 Class discussions



A Promising Approach

Percent of College Students Enrolled in 1 or More Online Courses

> 2012, 2011, 33.5% 32% 2005, 18%

"Teaching methods for quantitative literacy courses are not lecture and listen, but they may involve group work, projects, writing, and many of the approaches advocated by those in the calculus reform movement" (Ganter, 2012, p.8).

> Complementary Ideas

"An online course structured as a sequence of online lectures or textbook-based reading assignments followed by traditional assessments represents a passive form of learning that is teacher-centered and better aligned with the more traditional form of higher education" (Rovai, 2004)

The Course





"Traditional Quizzes"

45%

Discussion Forums, Writing Assignments

Data-driven projects 35%



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The Course – Traditional Quizzes

Suppose you have invested money in a savings account that pays a fixed monthly interest on the account balance. The following table shows the account balance over the first 5 months.

t = Time in Months	A = Amount in Account (\$)
0	1750.00
1	1771.00
2	1792.25
3	1813.76
4	1835.52
5	1857.55

- How much money was originally invested in the account? \$
- Find an exponential model for the account's balance A after t months. Round your values to 3 decimal places. A(t) =
- What is the monthly interest rate as a percentage? Round your percentage to 1 decimal place.
- What is the yearly interest rate as a percentage? Round your percentage to 1 decimal place.
- Suppose you made this investment when your daughter was born. Your plan is to leave the money in the account until she leaves for college at age
 18. How large a fund will she have? Round your answer to the nearest dollar.
- How many months will it take for the money to double? Round your answer to 1 decimal place.

Months

· Once the initial amount doubles, how long will it take for the amount to double again? Will the time be shorter, the same, or longer?

The Course – A Population Project



The Course – A Richter Scale Forum

My home MAT1020107-15447201440(FALL 2014) Logarithmic Models, 11/3 - 11/9 Earthquake Magnitudes in the News

Earthquake Magnitudes in the News

Find two news articles of your choice that discuss an earthquake that took place (make sure they're from within the past 5 years). Compare and contrast the magnitudes of the earthquakes on the Richter Scale, and use the mathematics of logarithms to discuss how the earthquakes differed in actual strength. You may want to consider the following questions to guide your discussion. Do the articles talk about the damage from the quakes? Do they compare the earthquake to other quakes in the past? Does the manner in which they discuss the damage surprise you, given the Richter Scale reading?

Your initial post (7 points) should be at least 150 words. You should also respond to someone else's post (3 points).

Separate groups: All participants

Add a new discussion topic

Discussion	Started by	Group Replies	Last post
Earthquake Magnitudes	Lauren Driggers	3	Samuel Tunstall
	2012		Mon, Nov 10, 2014, 7:52 AM
Earthquake Magnitudes in the News: Haiti vs Chile	👩 🔐 Hannah Bunn	1	Samuel Tunstall
			Mon, Nov 10, 2014, 7:35 AM
Earthquakes in Japan and Chile	Therese Krystina Docil	5	Samuel Tunstall



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Search forums

The Course – A Forum on Diana Nyad

My home MAT1020107-15447201440(FALL 2014) Exploring Concavity Further, 9/15 - 9/21 Swimming from Cuba to Florida: An Extra Credit Opp...

Swimming from Cuba to Florida: An Extra Credit Opportunity (6 Points to Project 2)

Diana Nyad is a 64 year-old super-athlete who has attempted the swim from Cuba to Florida multiple times. After one of her recent attempts, some internet sleuths took a look at her data and called into question whether she *really* made the swim all on her own.



Take a look at the following Excel file; it includes data of time versus the miles she swam. I have also included a scatter plot. What do you think? Post a well-articulated viewpoint of whether or not the skeptics' concerns are well-founded. Hint: to earn full credit on this, bear in mind that we are discussing concavity and ARC - your viewpoint should incorporate these concepts!

This is worth 6 extra credit points on the next project.

Add a new discussion topic

Discussion Did Diana make it by herself?



Replies

Last post Samuel Tunstall Wed, Sep 24, 2014, 7:42 PM

Search forums

N = 57 Students Take QLRA in 1st Week of Class

Online Math 1020 • n = 28 Students • Taught by graduate researcher • Weekly discussions and QL-based projects form majority of grade Face-to-Face Math 1020 • n = 29 Students • Taught by various graduate

- Iaught by various graduate instructors
- •Traditional assessment methods
- No specific focus on QL

All Students Retake QLRA in Last Week of Class

Figure 1 – Setup of Study

Pre- and Post-Test: The well-vetted 20-question **OLRA** (Gaze, et. al, 2014) • 20 math q's • 5 Likert q's Survey questions

Clearly there are limitations to this study

A Snapshot of the QLRA Results



	Difference In QLRA Average	P- value
Online Course (n=28)	1.21	0.014
Face-to- Face Course (n=29)	0.41	0.186

Possible Explanations

- An additional week on prerequisite material (sacrificing derivatives)
- Some of the applications were case studies from a QR text

Measuring Changes in Students' Affect

Numerical information is very useful in everyday life. ◎ 1 (Strongly disagree) ◎ 2 ◎ 3 ◎ 4 ◎ 5 (Strongly agree)

- Numbers are not necessary for most situations. 1 (Strongly disagree)
 2
 3
 4
 5 (Strongly agree)
- Quantitative information is vital for accurate decisions. I (Strongly disagree) 2 3 4 5 (Strongly agree)

Understanding numbers is as important in daily life as reading and writing. \bigcirc 1 (Strongly disagree) \bigcirc 2 \bigcirc 3 \bigcirc 4 \bigcirc 5 (Strongly agree)

It is a waste of time to learn information containing a lot of numbers. ① 1 (Strongly disagree) ② 2 ③ 3 ◎ 4 ◎ 5 (Strongly agree)

Significant Changes Online gains in Q1, Q3, and Q4

- Online loss in Q2
- No significant differences for F2F course

Average Differences on Likert Questions



Beyond the Numbers: Open-Ended Survey Questions

Question: It has been said that "The world is awash with numbers." Do you use math or numbers in your daily life, or do you avoid doing any type of calculations? Do you believe you would use them more if you knew how to use them correctly?

Typical F2F Pre/Post Response: Essentially the same!

Pre: I use them usually with a calculator, but I don't use any sort of formula in everyday life. I probably would not as day to day calculations don't usually require more than a calculator.

Post: I do use them in my everyday life. There are a lot of things that require numbers and to live without making calculations would be very difficult.

Beyond the Numbers: Open-Ended Survey Questions

Question: It has been said that "The world is awash with numbers." Do you use math or numbers in your daily life, or do you avoid doing any type of calculations? Do you believe you would use them more if you knew how to use them correctly?

A Pre/Post Response from the online Course

Pre: I do use math often, probably every day. I probably use it more than I realize. Post: Surely, math is used in every day life. Whether it is seeing how much longer we can sleep in before missing our bus, to calculating tips, to crunching numbers on performance evaluations, math cannot (and probably should not) be avoided. I think math can certainly be used more if used correctly. For starters, it is much easier to judge news articles as reliable when graphs and stats are understood. It is more understandable if a virus is really growing exponentially or if that word is just used incorrectly.

A number of students mentioned the course in their post-response.

Future Directions – Where Do We Go Next?

- Despite its limitations, this study provides promising teaching methods for:
- Online introductory math courses
- Any course with a QL designation
- Future research might include:
- A similar study, but with randomized subjects and the same teacher in more control sections
- Efforts to determine what components college algebra needs to merit a QL designation

Ouestions & Feedback © Contact: tunstallsl@appstate.edu



Citations

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