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Writing in Geology to Reduce Math Anxiety

Victor Ricchezza

University of South Florida, ricchezza@mail.usf.edu

H. L. Vacher

University of South Florida, vacher@usf.edu

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Writing in Geology to Reduce Math Anxiety

Victor J. Ricchezza and H.L. Vacher
University of South Florida (USF) School of Geosciences

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“Quantitative Literacy in the Affective Domain: Computational Geology Students’ Reactions to Devlin’s *The Math Instinct*” (Ricchezza and Vacher 2017)

Computational Geology

Since 1996, USF (through the Department of Geology and now the School of Geosciences) has offered “Computational Geology”. (1)

Word problems and spreadsheets in a geologic-mathematical context for quantitative literacy.

Evolution focus over 20+ years from spreadsheets to word problems (2).

- (1) Vacher, H.L. 2000. "A course in geological-mathematical problem solving." *Journal of Geoscience Education* 48 (4):478-481.
- (2) Ricchezza, Victor J., and H L. Vacher. 2017. "A Twenty-Year Look at “Computational Geology,” an Evolving, In-Discipline Course in Quantitative Literacy at the University of South Florida." *Numeracy* 10 (1). doi: <http://dx.doi.org/10.5038/1936-4660.10.1.6>.

Past Study

Interviews with 10 course alumni were conducted in 2015-16 (3). Alumni were asked (among other things): what should students in the course be learning now to help them succeed after graduation?

Communications was mentioned by 30% of interviewees (3/10).

A reading-and-writing assignment was integrated into the course in fall 2016.

(3) Ricchezza, Victor J. 2016. "Alumni Narratives on Computational Geology (Spring 1997-Fall 2013)." Master of Science Thesis, School of Geosciences, University of South Florida, Graduate Theses and Dissertations.

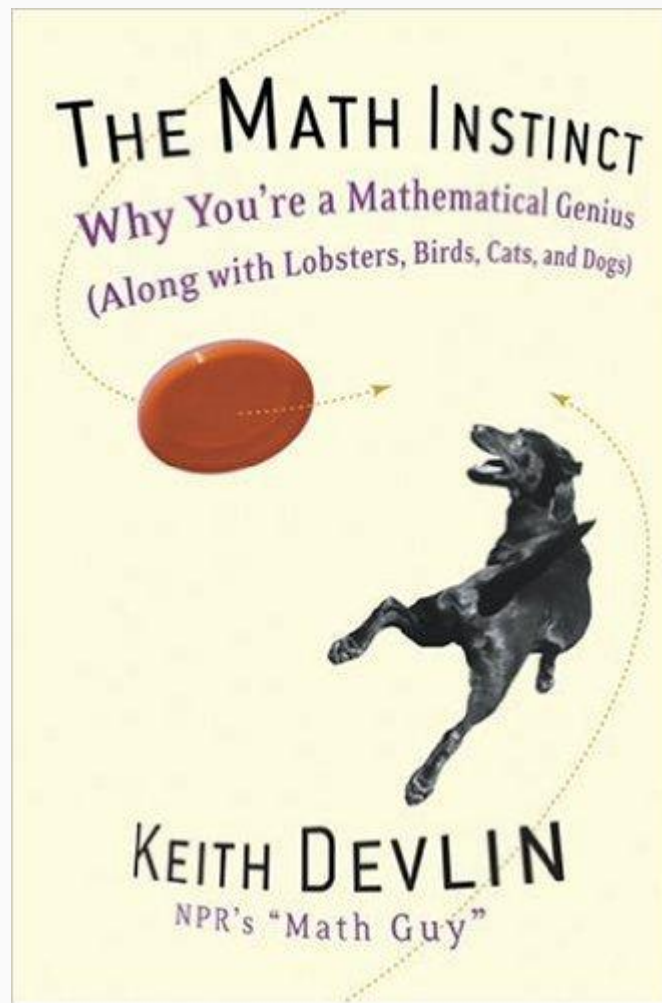
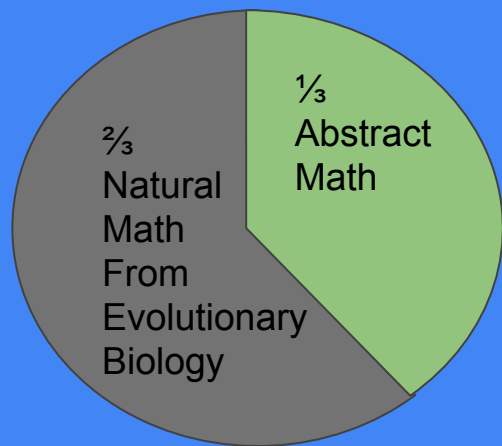
About the Reading and Writing Assignment

THIS WAS NOT INTENDED TO BE A STUDY!

Important to note at this point. We just wanted to improve their outcomes. Writing a paper or giving a talk wasn't on our minds.


We assigned a book. Len's hope: they'd enjoy a popular nonfiction book about math enough that they'd consider reading another one in this lifetime.

The Math Instinct
by Keith Devlin
(2005)




Assignment Details

Week 1: A short statement about their feelings on math.



Better than
Expected!

Weeks 2-14: A short statement about each chapter (1-13).



“We
have to
publish
this!”

Week 15: A reflection on the book, attitude changes.

Post hoc, ergo...

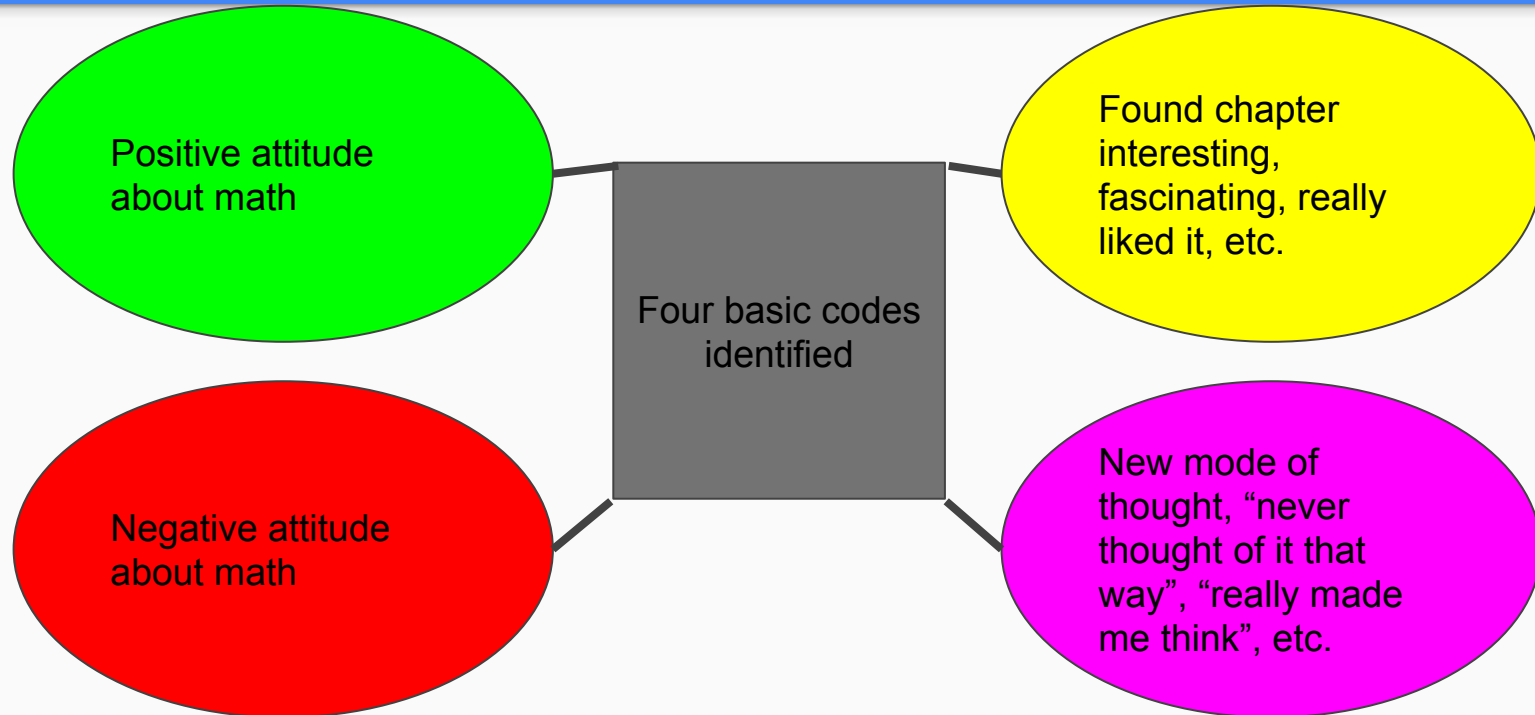
By the time we saw the responses, the semester was over. Some of these students had graduated.

USF IRB was AWESOME! They treated it as a records review.

Student names randomized, responses open coded.

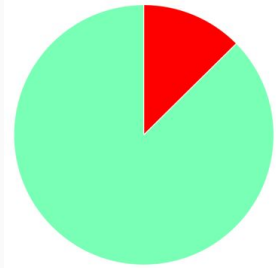


Coding



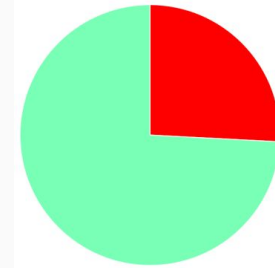
Results (Breakdown of Coded Responses)

a.



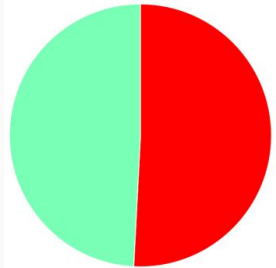
Green: 87%
assignment
completion rate

c.



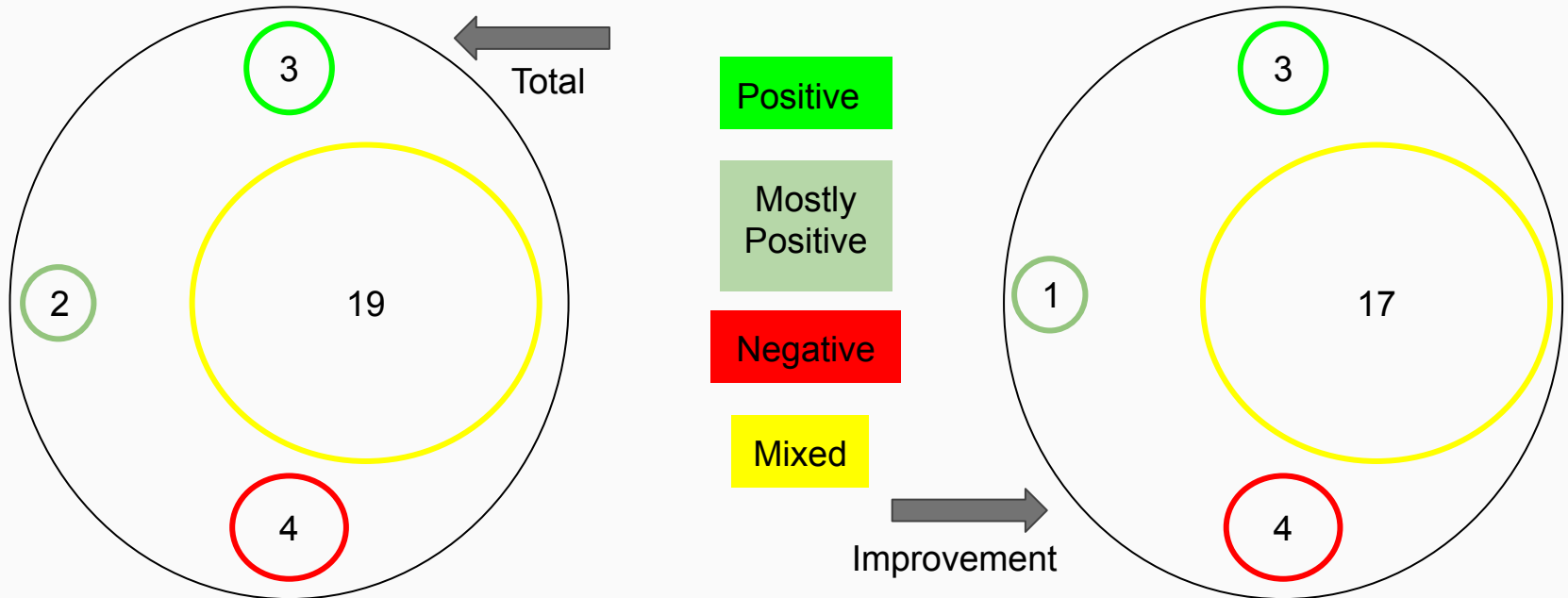
Red: 26%
“new thoughts”
rate

b.



Red: 51%
“interesting”
rate

Results (Attitude Changes)



Results (What they said)

I have had some bad experiences with math teachers and how they approach the subject.

This book has changed my perspective for the better toward math taught in the class and has opened me to the possibility of taking my math education further in terms of calculus 3.

Student 7

My first attempt at calculus 2 is the stuff of nightmares.

Going back to basics to understand why we learn the way we do and how we think helps me to perform better.

Student 15

Results (What they said)

There is no way I'm going to be able to walk past a tree anymore without stopping to examine a branch to see if the leaves have a divergence that includes Fibonacci numbers.

This book makes me want to become a math teacher. (...) I want math to have meaning for everyone.

Student 19

I only perceived math as a tedious and necessary requirement for a program.

I do not think my perception of mathematics has changed significantly from reading this book as most of my personal success in the subject has been with effort and resolve. However, I better understand why abstract math is incredibly difficult to grasp and retain.

Student 24

Limitations

One class, one section, one semester, one book, one grader, one coder, studied after the fact.

$N=28$.

Qualitative coding by one researcher without reliability measures.

Great care must be taken before giving in to any urge to generalize these results beyond this experimental group and setting.

What it Means (Takeaways)

Students often enter our class and major with a damaged attitude about math that this data suggests comes from past math classes.

Student feelings and attitudes about math can change over time - positively - given help, context, and encouragement.

These students aren't getting what they need from the math department! It's up to us to fill the gaps (with things like units).

What Next?

One reviewer rhetorically asked the question of whether the results would be similar with a different book.

We don't, at present, have the chance to find that out due to other projects, but we encourage you to do so and share your findings with us (and with everyone else)!

Questions?

ricchezza@mail.usf.edu

Want the full paper?

<http://scholarcommons.usf.edu/numeracy/vol10/iss2/art11/>