Using open resources in a freshman general education course for non-STEM majors to promote learning and improve attitudes towards mathematics

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- Math 1003 College Mathematics (Quantitative Literacy)
  - 19 or greater on Math ACT
  - Or C or higher in intermediate algebra

- Typical Units which I cover
  - Statistics
  - Finances
  - Linear programming
  - Apportionment/weighted voting systems/gerrymandering/IRV
  - Art and mathematics
  - Identification numbers

- Note: I write my own exercise problems and use the open resources to motivate and provide background. Throughout the semester they read about selected mathematicians: Alan Turing, George Dantzig, Grace Hopper, Terence Tao, Maryam Mirzakhani, Richard Tapia, David Blackwell, Arlie Petters, William Tutte, Moon Duchin

Open resources as a replacement, not to supplement – Why?

- So much is available
- High and increasing cost of texts
- Continuing increase in the size of texts
  - Students pay for 800 – 1000 page text
  - Cover 1/3 to 1/2
  - Have we ceded control of the curriculum to textbook companies?
- Custom publishing is not the answer

What open resources are effective to promote learning and attitudes?

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- TED talks
  - Angela Duckworth on “grit”
  - Chris Domas on “the 1’s and 0’s behind cyber warfare”
- Youtube
  - Colbert Report – Terence Tao
  - David Letterman – Grace Hopper
- TV clips
  - CBS Sunday Morning report on Alan Turing
  - CBS Evening News report on rebuilding after the Great East Japan Earthquake and tsunami of March 11, 2011

- Websites
  - John Edmark – Lecturer at Stanford
  - Marcel Finan – my colleague at Tech
  - Wikipedia
  - WolframAlpha
  - MC Escher
- Newspapers
- Curiosity Stream (not open – requires minimal subscription)
  - The Origami Code
  - Codebreakers – the secret genius of WWII (William Tutte)

Evidence of learning and improving attitudes???

- Grades – no noticeable change
- Attitudes: (comments on course evaluations)
  - Introduced us to many different arts that are related to math and it was very enriching and eye opening
  - This class is so fun! I enjoy going to it and look forward to it.
  - The material was taught through sources on the internet, and I liked that much better than a textbook. The strength of this class was the way the professor related our assignments to everyday things
  - It teaches mathematics from a more practical, application-based approach, actually giving students a literal example of how it works in the real world. For students like myself who wonder just how often some of these principles will come up in our professional lifetime (looking at you, quadratic theory), this is an enjoyable change of approach

Journal comments

- This week was a very fun and unique week. We learned how orgami and music relates to math. This made me have a better appreciation for math
- This week we learned more about mathematics in art. We looked over M.C. Esher's work. This was very interesting!
- I loved the hairdryer and ping pong ball example. It was enjoyable. I am liking what we're doing so far and I am excited to learn more.
- It has showed me that math can be really helpful in the real world. I came in to the class thinking that math was something I would never use again once I was done with college and after this course I have learned some very realiable resources to use out of college that has to do with math. So for my last journal entry I would like to say thank you for making math interesting for me and for teaching me real world tools with math.
- ……it was really neat to see just how all of it works. It really makes me realize that math is literally used just about everywhere in life.

- I did not know that there was math in the creation of movies. That was crazy and really mind blowing for me. We got to draw extra credit tesselations and this was very fun!
- This week was so fun and relaxing.
- Grace Hopper was interesting to learn about in class. It was very empowering to learn about women in mathematics, because I have always had men teachers for my math classes in grade school
- It was super interesting to see how origami can be used in mathematical and scientific ways, such as for steints when people have heart problems.
- I think this class has given me a more positive outlook on math
- My attitude towards math has changed tremendously since I have been in this class. I no longer feel like math is difficult, instead I like it. I no longer think it's for certain people who are good in math, but I think if a person is willing to learn and apply themselves then it can be easy and understandable.

Questions or comments??

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