Appendix to: Mathematically Engaging Students in Their World

Some Videos You Might Consider for Classroom Use

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This is an appendix of "Mathematically engaging students in their world" by Jeff Irvine that appears in the Ontario Mathematics *Gazette*, *60*(1), 25–28.

Note that this is not nearly an exhaustive list. The videos listed below are ones that I have found work well for my classes, although, like most instructional resources, you need to choose videos that are a good fit four your own students.

Math and Art

- www.youtube.com/watch?v=EAITrDCmEr4 5:53 Math and art at an art exhibition.
- www.youtube.com/watch?v=Kcc56fRtrKU 4:00 Escher art.
- www.youtube.com/watch?v=pg1NpMmPv48 5:06 The geometry of Islamic designs,
- www.youtube.com/watch?v=c8ccsE_IumM 9:45 Fibonacci and the golden ratio.
- www.youtube.com/watch?v=9mozmHgg9Sk 10:18 Music, Fibonacci, and the golden ratio.
- www.youtube.com/watch?v=fDSIRXmnVvk 5:28. Chaos and art. A dynamic example of parametric equations.

Math and the Real World

- www.youtube.com/watch?v=_UVEF3qXtSo 2:43 Math in nature.
- www.youtube.com/watch?v=dpv06SFHtRg 5:32 Math in the real world. About a dozen examples, with formulae, set to music, no words.
- www.youtube.com/watch?v=F1hX_nzTlgU 4:12 Turing reaction-diffusion system.

Mathematical Modelling

- www.youtube.com/watch?v=dCFqqI9Ig8U 3:13 Math models to predict climate change and weather.
- http://statathlon.com/historical-predictive-analysis-for-the-100m-sprint-race/ Data for the comparison of men's and women's 100 m races.
- www.youtube.com/watch?v=bafyc-hkArw 10:21 Ten major hurricanes.
- www.youtube.com/watch?v=lqfExHpvLRY 1:51 Hurricane categories illustrated.
- www.youtube.com/watch?v=0uJMj0j9cA4 2:37 Hurricane categories explained.
- en.wikipedia.org/wiki/Saffir–Simpson_scale Hurricane rating scale.
- www.youtube.com/watch?v=sHYFJByddl8 4:55. Using math to predict the future, including the Game of Life.
- www.youtube.com/watch?v=xHtsuOB-TPw 3:12 Math model series v1. The other volumes can be found in the right margin of the video.

Astronomy

- www.youtube.com/watch?v=n6dbT9StGCE 8:41 Interesting discussion of why Pluto was demoted from planetary status in 2007. Why Pluto is not a planet.
- www.youtube.com/watch?v=A1d9249R-4M 52.47 Pluto and its moons interesting, but far too long for use in a classroom. Could be suggested for students who are really keen on the topic to watch outside of class.
- www.youtube.com/watch?v=Z_2gbGXzFbs 4:44 Interesting discussion of Pluto and the solar system. Discusses relative scales of planetary sizes and distances between planets, and why Pluto was demoted from planetary status.
- www.youtube.com/watch?v=mQrlgH97v94 3:08 Song about the solar system after 2007.

Exponential Relations

- www.youtube.com/watch?v=PUwmA3Q0_OE 6:24 Population growth through time, modelled by an exponential function.
- www.youtube.com/watch?v=neAzeAAq0hc 10:26 Population growth by country over time. A bit long and slow, but may appeal to students who identify with a particular country other than Canada.
- www.youtube.com/watch?v=khFjdmp9sZk 5:46 Population growth related to environmental factors and extrapolated to the year 2050.
- www.youtube.com/watch?v=F4sr2jUIHZI 7:47 Newton's law of cooling. Uses an exponential model. One of my favourite problems is: If one wants to keep their coffee as hot as possible for as long as possible, should one put the coffee in first, or wait until you are ready to drink the coffee and then add the cream?
- www.youtube.com/watch?v=f6spBkVeQ4w 5:54 Viscosity flow races.
- www.youtube.com/watch?v=qfYQUUC3F5I 2:28 Using M&Ms to illustrate exponential growth.
- www.youtube.com/watch?v=71yuH365Rug 4:18 The familiar chessboard problem.
- www.youtube.com/watch?v=AmFMJC45f1Q 3:48 Paper folding to reach the moon.
- www.youtube.com/watch?v=1_SwKG4Zt60 3:38 Exponential illustrated with people standing in class.

Linear Relations

I didn't find any videos illustrating linear relations that I found entertaining. That doesn't mean that there aren't any, but linear relations can be done in class through student investigations.

Logarithmic Scales

- www.youtube.com/watch?v=YlEj6P8BhsQ 2:50 Logarithm song.
- www.youtube.com/watch?v=NaNw9LHq9dc 4:56 What is the Richter scale?
- www.youtube.com/watch?v=NT_fVQ1LdQY 7:41 Top earthquakes on camera.
- www.youtube.com/watch?v=r3hirzlWILM 3:48 pH heavy accent.

- www.youtube.com/watch?v=Pkar6RgYvIE 8:30 pH and its impact on hair. A bit long, but may appeal to students who don't relate well to math. Might be used for student viewing outside of class time.
- www.youtube.com/watch?v=wqYSTUI0hpI 5:07 Star magnitudes. Potentially interesting because stars with more negative magnitudes are brighter.
- www.youtube.com/watch?v=gieSbj2svwY 3:09 Fujita tornado scale. Although not truly a logarithmic scale, some students may be interested in how severity of tornadoes is classified.

Quadratic Relations

- www.youtube.com/watch?v=xPugzTVlLGA 2:24 One of several videos of the Detroit airport parabolic fountains, I believe this is one of the better ones.
- www.youtube.com/watch?v=g4cjHuMPK9s 3:15 Laminar flow at Detroit airport fountains.
- www.youtube.com/watch?v=or8i_EvIRdE 2:48 Detroit airport fountains.
- www.youtube.com/watch?v=y7Hyc3MRKno 14:02 Laminar flow in a science fair project.
- www.youtube.com/watch?v=HBeQkX0WzCo 3:47 Laminar flow.
- www.youtube.com/watch?v=VKkQan82ukI 2:42 Constructing a laminar flow nozzle.
- www.youtube.com/watch?v=xPugzTVlLGA 2:24 Detroit airport fountains.
- www.vimeo.com/27378299 1:13 Detroit airport fountains.

Sinusoidal Relations

- www.biorhythm-calculator.net/ biorhythm calculator. Displays sinusoidal graphs of personal biorhythms.
- en.wikipedia.org/wiki/Biorhythm Debunks biorhythms and indicates that biorhythmic predictions are no better than pure chance.
- www.youtube.com/watch?v=OP0cpXpw8yk 1:19 Bay of Fundy tides time lapse.
- www.youtube.com/watch?v=1SRz6vKTXnA 15:23 Explains mathematical modelling of tides but is long and not very dynamic.
- www.youtube.com/watch?v=ddq0es6xpz4 20:56 Sinusoidal modelling. Long and not very dynamic.
- www.youtube.com/watch?v=Y5jr_zv2Y9M 6:45 Business cycle showing sinusoidal pattern.
- www.youtube.com/watch?v=gZ_KnZHCn4M 4:48 Simple harmonic motion and Hooke's Law. A lot of physics in this one, but illustrates sinusoidal motion over time.
- www.youtube.com/watch?v=XjyOYluqnDM 5:02 Simple harmonic motion and sinusoidal graphs.
- www.youtube.com/watch?v=JSBw-JyFgZk 2:27 Circular motion and simple harmonic motion.

Systems of Equations

- www.youtube.com/watch?v=w8T6_ZFghf4 2:29 Jamology—the mathematics of traffic jams.
- www.youtube.com/watch?v=8Kg21jBCm-k 12:47 Traffic flow using systems of equations. Similar to Kirchoff's laws for electricity. Uses matrices to solve a system. Illustrates the necessity of making assumptions, such as one-way streets, and no cars enter or leave the system partway down the block.
- www.youtube.com/watch?v=ZDoyIghUI44 6:25 Kirchoff's laws for electrical current. Solve using systems of equations.
- www.youtube.com/watch?v=dgkaE7eiY5w 19.18 Kirchoff's laws of electrical current. Video is long with a lot of talk.
- www.youtube.com/watch?v=0gRtVz4XrZM 11:02 Kirchoff's laws for electricity. Thorough explanation, but not really entertaining.