“Waves Go Round!” An Exploration and Investigation on the Functions, $y = \sin x$ and $y = \cos x$

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Conference for the Advancement of Mathematics Teaching
Goals of the Rice University Mathematics Leadership Institute

- Develop teacher leaders

- Expand teacher knowledge in mathematics and pedagogy, to develop highly qualified mathematics teachers
Goals of the Rice University Mathematics Leadership Institute

- Develop highly qualified teachers who are willing to create and share innovative and effective teaching and learning activities
Goals of the Rice University Mathematics Leadership Institute

- Provide instructional support to teachers through a network of high school teachers and college faculty members
Goals of the Rice University Mathematics Leadership Institute

- Provide model mathematics classrooms, which demonstrate student engagement, rigorous learning opportunities, and the effective use of technology
Eisenhower Demographics

- Total Students: 1852
  - 10th Grade: 694
  - 11th Grade: 632
  - 12th Grade: 526

Ethnicity of Student Population

- Caucasian: 49%
- Hispanic: 46%
- Asian: 2%
- African American: 3%
Eisenhower Demographics

Student Economic Status
- Economically Disadvantaged: 22%
- Not Economically Disadvantaged: 78%

At-risk Students
- At-risk: 28%
- Not at-risk: 72%
Exploring Functions and other Mathematical Concepts
Exploring Functions and other Mathematical Concepts
Exploring Trigonometric Functions

• The Unit Circle
Graphing $y = \sin x$ and $y = \cos x$
Writing Trig Equations given graphs.

• When do I use the calculator?

http://www.online.math.uh.edu/Math1330/ch5/s52/index.html
Exploring the functions, $y = \sin x$, & $y = \cos x$ with a rolling hula-hoop.
Incorporating the Internet

- Research Skills
- Data collection
- Students learn to search and use software they have not used before.
Solving word problems on Trigonometric Functions. (IB) about the clock.
Transforming the unit circle into the graphs of

\[ y = \sin x \quad \& \quad y = \cos x. \]
Unexpected (Great) Outcomes from the lesson

• More concepts are explored, i.e. Cycloids

• More extension projects, i.e. sound, music (differentiated curriculum)

• More collaboration that leads to more independence

• Increased appreciation of more rigorous math content
Suggestions for incorporating exploratory lessons

- Do not feel compelled to revise your entire curriculum
- Just add it in.
- Students discover how concepts are interrelated and connected into a one big whole.
- *Relevance* is Theory translated into practice.
- *There’s nothing like learning while having fun!*
What about worksheets?!

QR coded problems with scavenger hunt.
How to generate QR code for trigonometric functions?

http://qrcode.kaywa.com/
Mathematics concepts turned into beautiful art work!

• Getting students to learn to graph trig functions
Ultimate Purpose of Teaching

The ultimate purpose of teaching is to equip the students with the skills and the desire to explore and investigate their world so they can be truly effective and efficient human beings.
Thank you.

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This presentation is available on:
www.epsilen.com/dgbrowne
Resources

- District Coordinator, AISD
- *Precalculus with Trigonometry Functions and Applications*, Paul A. Foerster. Addison-Wesley, © 1993, USA
- [http://www.online.math.uh.edu/Math1330/ch5/s52/index.html](http://www.online.math.uh.edu/Math1330/ch5/s52/index.html)
- [http://qrcode.kaywa.com/](http://qrcode.kaywa.com/)