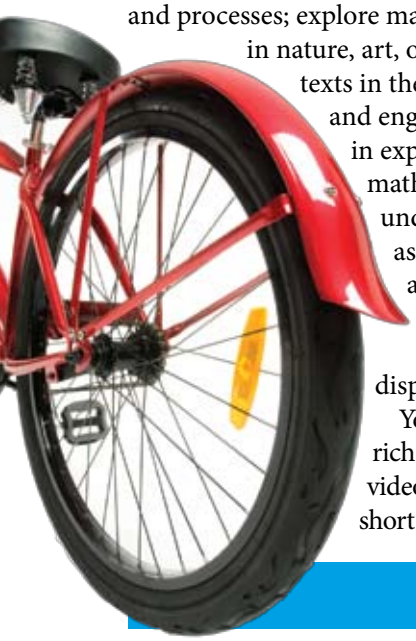
This Rock 'n' Roll Video Teaches Math



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By Margaret L. Niess and Janet M. Walker

Mathematics is a discipline that has significantly advanced through the use of digital technologies with improved computational, graphical, and symbolic capabilities. Digital videos can be used to present challenging mathematical questions for students. The National Council of Teachers of Mathematics' *Principles and Standards for School Mathematics* state that visualization is an important tool in problem solving, and students need multiple visualization opportunities to fully develop this skill. Watching, analyzing, and creating digital videos provide unique opportunities for guiding this development.

Video clips offer instructional possibilities for moving students from a passive mode of watching to active exploration of mathematical ideas. Video clips (short excerpts from movies, television shows, professionally prepared educational videos, or personally created videos) can be used to introduce new mathematical concepts and processes; explore mathematics in nature, art, or other contexts in the real world; and engage students in expressing their mathematical understandings as they think about what has been said or displayed.

YouTube is a rich source for video clips and short movies that will challenge students to watch carefully and engage in mathematical thinking. Consider, for example, Abbott and Costello's 1941 movie *In the Navy*. This video has a scene where Lou Costello is explaining to Bud Abbott that he has 28 donuts to share among seven people. Lou decides he can fairly and equally share the donuts by giving each person 13 donuts. Bud questions Lou's thinking, and the scene progresses until Bud gives up trying to convince Lou that his arithmetic is wrong.

Discuss Costello's division method with students. Does Costello's method work for all division problems? Why is his method incorrect? Why are Costello's multiplication proof and repeated addition methods incorrect?

Analysis is at the heart of reasoning in mathematics. Students need experiences that guide them as they learn to reason mathematically. They need opportunities to make conjectures based on their analyses and to communicate the thinking that directs them toward these conjectures. Engaging students in analysis of events in video clips is one way of providing these important experiences. Integrating digital videos with other media, such as Geometer's Sketchpad, spreadsheets, calculators, and virtual manipulatives, affords students many opportunities to create, use, and make sense of multiple representations of mathematical ideas.

In grades 9–12 students develop insights into mathematical abstraction and structure by exploring the behavior of nonlinear relationships for polynomial, exponential, rational, and periodic functions. Set up a scenario in which a student is riding a bicycle with a rock lodged in its tire. You can even bring a bicycle into the classroom or make a video of the event.

Ask students to describe the path of the rock if it were graphed on an x–y axis, where x is the distance the bike goes and y is the height of the rock embedded in the wheel. As students analyze the motion of the rock embedded in a bicycle wheel, they are engaged in the mathematical processes for identifying a specific functional notation for the motion. They can develop tabular and graphical representations of a particular situation to aid in visualizing the mathematical situation.

Students can watch an animated cycloid of the path of the rock as a function of time on the site Math Demos.

Consider similar projects of other objects in motion, such as a seesaw, a Ferris wheel, or other carnival ride. Ask students to describe the types of graphs created by these motions. Students can create videos of the motions, analyze the videos, and gather data for generating the graphs. They can also simulate the motion of these different objects using Geometer's Sketchpad.

Students can create several types of videos to enhance learning in the mathematics classroom. They might use digital video equipment to create a teaching video in which they teach a mathematical concept or process. Students can also create a digital video of choreographed movements, such as those made by a dance team or marching band. They can even design their own choreographed segment and film it. In either case, students should focus on the mathematics of the movements, which will, of course, require teacher scaffolding.

Mathematics

"Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning," according to the *Principles and Standards for School Mathematics*. With the guidance of a skillful teacher, digital videos can both enhance students' learning of mathematics and engage students in mathematical thinking.

Resources

Geometer's Sketchpad: www.dynamicgeometry.com
In the Navy: www.youtube.com/watch?v=7WMi5TUJDso
Math Demos: http://mathdemos.gcsu.edu/mathdemos/cycloid-demo/index.html

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