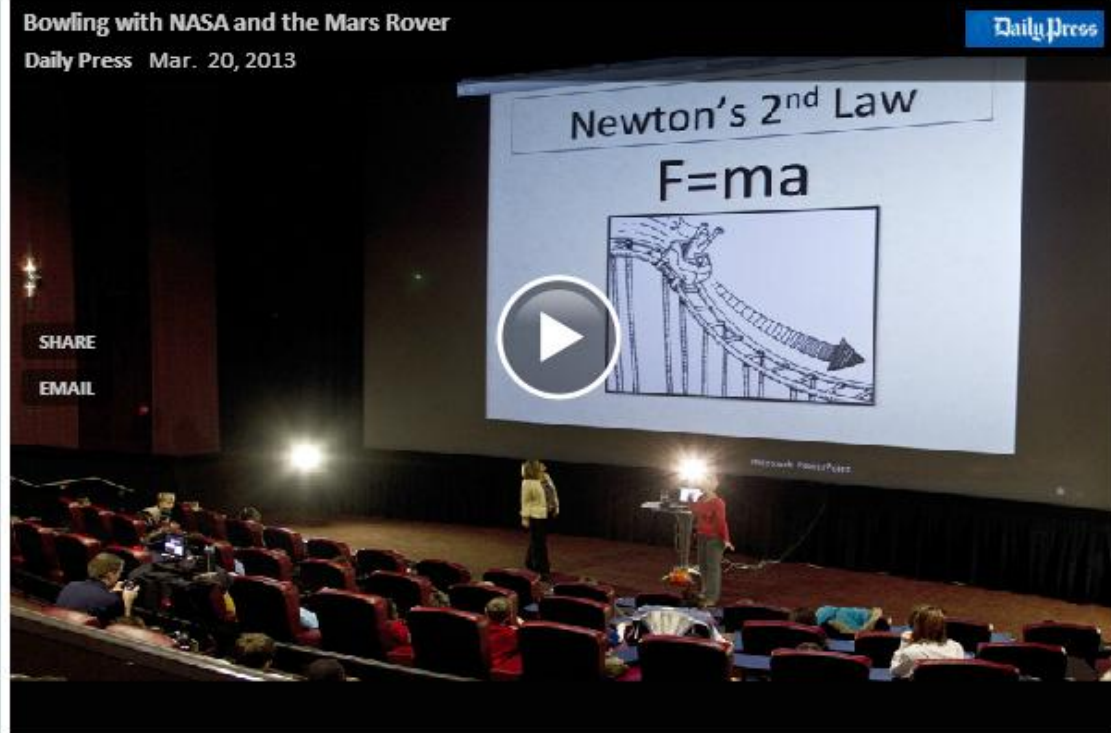


Bowling balls and the Mars rover team for a math lesson

NASA Langley educators and engineers teach Hampton students about Newton's laws



About 140 fourth and fifth graders from Kraft Elementary School are learning about Newton's laws of motion, with the help of NASA engineers who built the Mars Rover.

By **Cathy Grimes**, cgrimes@dailypress.com | (757) 247-4758
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Kolby Davis, in a red shirt and fresh Mohawk haircut, stepped to the lane line, hefting a chartreuse bowling ball in his left hand. The fifth-grader studied the pins, then with a flick of his wrist sent his ball spinning down the alley at Cine Bistro. The ball hooked, then knocked down seven pins. On his second roll, he caught the remaining three, earning a spare. He hopped and raised his arms in satisfaction.

Kolby, a fifth-grader at Kraft Elementary School in Hampton, was one of three students who bowled a frame to demonstrate Isaac Newton's second law of motion on Wednesday morning. The students were among more than 140 who participated in the math and physics lesson at the off-campus venue, a collaborative venture between the school division, **NASA** Langley Research Center, Cine Bistro and the City of Hampton. NASA education specialists teamed to present the lesson and a crew of technicians filmed the event and live-streamed it on NASA's Digital Learning Network.

In addition to bowling, the lesson involved the Mars rover, rockets and a guest appearance by one of the engineers who worked on **Curiosity's** entry, descent and landing on the red planet.

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NASA Langley spokeswoman Kathy Barnstorff said NASA Langley technicians used iPads and laptops to film and stream the event on the NASA Education Digital Learning Network.

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The fast-paced hour-long program took place in a theater that would show "Oz, the Great and Powerful" later that day. Students slipped into the oversized theater seats, catching sight of themselves on the movie screen and waving, pointing and smiling. NASA Education Specialist Bonnie Murray organized an impromptu wave before launching into the lesson with digital learning network manager Caryn Smith-Long.

The two bantered in an almost vaudeville style as they traded quips and demonstrated Newton's three laws of motion, using a tennis ball, a bowling ball and a balloon rocket as props. All the while they asked students questions and beamed when they responded.

Kolby was among the first to raise his hand, proudly reciting Newton's first law of motion: An object in motion stays in motion. An object at rest stays at rest.

Students harked to the three young bowlers' efforts as an example of that law: bowling pins are at rest until a ball slams into them.

The star of the show was NASA Langley engineer David Way, the entry, descent and landing team leader for the Curiosity mission, who spoke to the students via video connection. He beamed down at them from the big screen like a blue-shirted Oz, and asked them to waggle "Gangnam style" if they could hear him. The students immediately launched into the hand motions of the viral video dance.

Way told students he had been working on the project longer than most of the students had been alive, beginning in 2001. When a student asked if he ever thought about giving up, he said yes. The launch was delayed at least twice before Curiosity was shot into space on the nose of an Atlas rocket.

Way said Newton's second law, force was his favorite, and "had everything to do with" the successful landing on Mars. In fact, he said he used elements of math he learned in elementary school as well as geometry and algebra when working on the challenge of landing the rover.

"It's that math and knowing scientific laws that allowed us to do really cool things like land rovers on other planets," Way said.

He noted that NASA engineers modeled all the forces that would affect the rover on their computers, then had students identify those forces and other elements that affected the rover at every step of the descent, using a series of illustrations. Hands shot into the air and students shouted answers, which Way linked to the laws of motion.

He ended his presentation with a video clip of the Curiosity landing. "I still get pretty nervous every time I watch this," Way said, adding that because of the engineers' calculations – using math and Newton's laws – they were able to land within seven seconds of their anticipated touchdown time and within about 1.5 miles of the targeted landing spot.

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Students applauded when the video showed NASA engineers celebrating the successful landing.

Kraft fourth-grader Cameron Hatchett said the Cine Bistro event "makes me look at math differently. It's fun."

Kolby, for whom bowling is probably his favorite sport, said he thinks in terms of angles when he rolls a ball down the lane. But he plans to remember Newton's laws the next time he approaches a lane. "Before I bowl I'll think of all the equations in my head."

Remember Newton's laws?

Sir Isaac Newton developed three laws that have become known as Newton's Laws of Motion.

First law: A body in motion at constant speed will remain in motion at that speed unless acted upon by an outside force. A body at rest will remain at rest, unless acted upon by an outside force.

Second law: Force equals mass (or weight) times acceleration.

Third law: Every action has an equal and opposite reaction.

Source: NASA