
the stars
challenge
Explore, Imagine,
and Build
Winter 2013

We had an exciting time studying inertia and forces. We investigated inertia - the tendency of an object to maintain its state of motion and the effect forces have by changing the state of an object's motion. We applied our understanding of inertia and forces to perform such "magic" tricks as: removing a dollar bill from between two bottles, wearing a stationary inertia hat while the wearer spins underneath it, and giving the illusion that a block of wood remains stationary while a dowel is hammered through it.

We showed how centripetal forces only change the direction of an object by constructing the classic whirl-a-glass-of-water-over-your-head device and a model of the spin ride found at amusement parks. We discovered that all rides swing at the same angle regardless of mass!

We then studied how force acting through time enables an egg to be thrown against a sheet and remain unbroken - an explanation of the added safety resulting in having air bags in automobiles. We continued with our study of forces by studying how force acting through a distance changes the energy of an object and then relating energy to food calories. We were shocked to calculate how much energy is needed to keep one human alive. Using this information, we realized how difficult it is to produce energy without impacting the environment.

Force acting through a perpendicular distance produces torque - a rotating force. Using this concept, we constructed several "magical tricks" such as: the non-stationary cup, the impossible balancing man, and the balancing fork and spoon. We also investigated the electrical force by constructing a challenge toy similar to the game operation.

We concluded our study of physics with an investigation of wave motion: light and sound. Using rainbow glasses, we discovered a surprising property of light: white light is an illusion! In reality, white light is composed of all the colors of the rainbow. To investigate sound we made sound toys such as: the PVC pipe kazoo, the soda straw harmonica, and a talking cup that says, "Science is Phun!"

Aidan pulls the dollar bill out from between the two bottles demonstrating inertia.
Madison and Jack demonstrate inertia using the inertial block device.

The class shows off their inertial bottle challenge as well as their inertial block device.

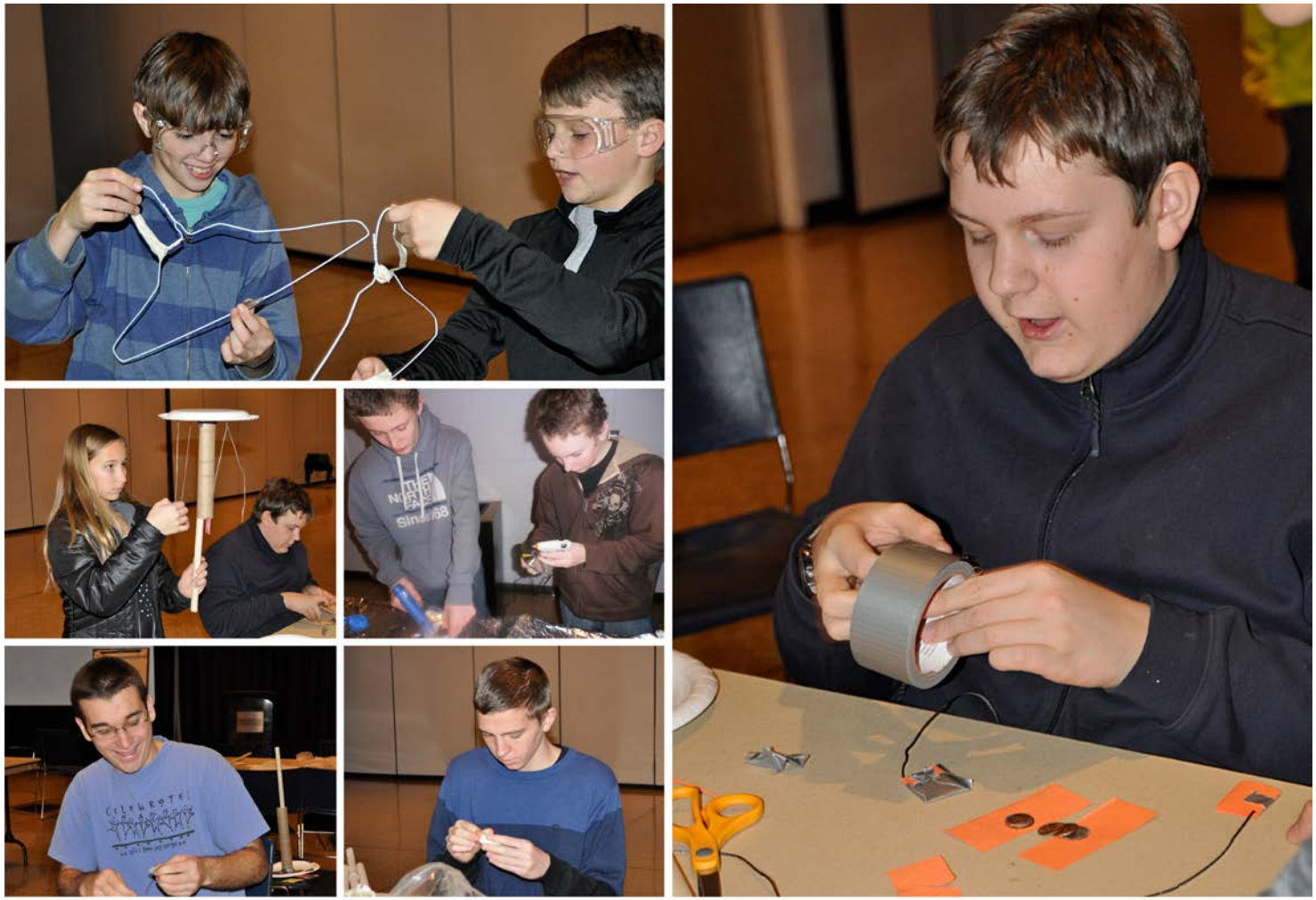
Kyle almost gets the dollar out from between the bottles—good try! Stephen and Tristan are busy making their inertial bottle challenge while Nichol, Madison and Derek get ready to try their luck.

Derek shows off his inertial hat while Matthew and Kyle are busy constructing theirs. Mr. Valente shows Haydn how to use the inertial block device. Devin and William make a good team as they work together constructing their physics “toys”.

Oops! William forgot to attach the wooden blocks to his inertial hat. Ryan helps Stephen cut wood for the inertial hat.

Kyle explains how the water stays in the cup as the cup is whirled around his head. William constructs his centripetal force toy. Ian is careful not to let the tornado out of the bottle.

Nichol and Tyler show of their inertial hat while Tristan is amazed to make a tornado in a bottle. Matthew chooses his construction tool with great care, while Mr. Valente helps Arnold and Tyler to construct their inertial hat.



Matthew and Ian practice to win the spinning balancing penny challenge. Arnold and Nichol are busy constructing their swing ride. Dan Zucker and Ryan Heard, class teaching assistants, enjoy helping the students construct their “toys”.

Aidan shows off his swing ride. Stephen and Tristan construct their swing ride while Dan helps Tyler cut a wooden dowel.

Kyle explains how to construct the CD balloon air puck to Jack and Derek. Ian is drilling holes in the wood for his inertial hat.

Jack attempts the torque challenge. Mr. Valente explains how the bottle balances to Haydn and Matthew.

Mr. Valente explains to the class what a salad spin, washing machine and a rotating space station have in common. Nichol and Matthew cheer on Madison as she tries to shoot-the-moon. Haydn tries his hand at the shoot-the-moon challenge.

Try as they might, the class can't break the egg by throwing it against a sheet. Devin, Kyle, Aidan and Matthew help Mr. Valente demonstrate which ball rolls down the tracks first.

The teams of Stephen and Tristan and Derek and Devin try to design the winning roller coaster.

Mr. Valente shows the class how sound was recorded in the “olden days”. Madison, Nicole and Kyle can’t believe their ears: is the cup saying, “science is fun”? It is, of course! Arnold cuts wood to use to construct his electrical buzzer challenge.

Aidan and Mathew can't believe what a vibrating hanger sounds like. Derek and Devin help each other construct their electrical buzzer challenge. Arnold, William and Tyler discuss with Ryan how much wire is need to construct the electrical buzzer challenge.

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The Stars Challenge at Monmouth University