Roller Coaster

Camryn Mikesell & Team Members

New Tech Network Project Spotlight
@ St. Charles Satellite Center

Engineering Design

Engineering Design is intended to introduce team members to the field of engineering and engineering design. This course provides an overview of engineering principles and practices that are emphasized through hands-on experiences in a wide range of engineering technologies using industrial-quality equipment and software. Physics is also taken in this course.

Driving Question

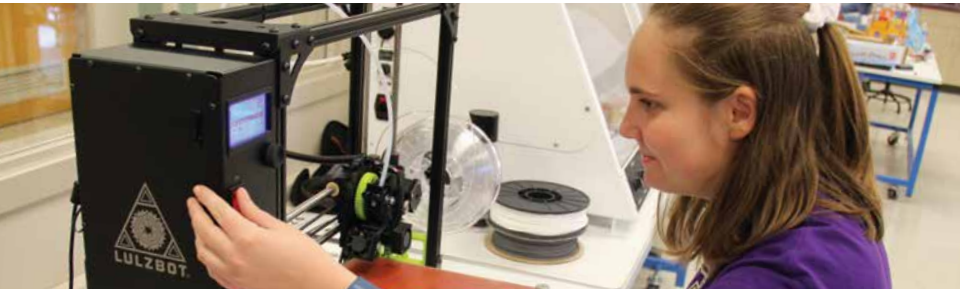
How can we use our knowledge of kinetic energy, potential energy, conservation of energy, and conservation of momentum to design a complex motion machine?

Camryn and her team members were challenged to build a unique roller coaster, made entirely of reused/recycled materials and fit for a marble passenger, that meets the following requirements and specifications:

- Marble has to roll freely and unassisted through the coaster to the bottom once it reaches the top
- The marble must stay on the track through the entire distance except for designed jumps
- The marble must make one successful jump over an open gap of at least 6 inches

- The marble must complete a vertical loop during its ride to the end
- The coaster must have one collision – momentum event
- The marble coaster ride is to last at least 15 seconds
- The roller coaster must be attached to a fixed area no greater than the table top – 30" X 72"
- The height shall be such that the roller coaster on the table top can fit through the workcenter double doors
- The marble is to be visible for at least 75% of the length of the roller coaster
- When the marble gets to the bottom, it is to roll into a storage location, which does not interfere with the operation of the roller coaster (it must not roll off the table)

In designing and constructing the roller coaster, Camryn and her team members will have the opportunity to apply concepts of motion (such as speed and acceleration), forces (such as gravity and friction), energy (such as potential and kinetic energies and the conservation of energy) and momentum (such as conservation of momentum). Project presentations are scheduled for December 15.



Louisiana State Standards: Physics with a Focus on Energy Standards

P19. Explain quantitatively the conversion between kinetic and potential energy for objects in motion (e.g., roller coaster, pendulum) (PS-H-F1)

P20. Calculate the mechanical advantage and efficiency of simple machines and explain the loss of efficiency using the dynamics of the machines (PS-H-F1)

P22. Analyze energy transformations using the law of conservation of energy (PS-H-F2)

P24. Apply the concept of momentum to actual situations with different masses and velocities (PS-H-F2)

**Note: the only Energy standard (P23) team members will not engage in this project applies the law of conservation of momentum to collisions in one or two dimensions and includes angular momentum (PS-H-F2).*