Roller Coaster Experiment

Demo/Intro:
Show centripetal force by filling a bucket with water and swinging it in a circle, water will stay in the bucket (showing how the marble will stay going around the loop and not just fall down)

Explain first law of physics “Object in motion stays in motion unless acted upon by another force”. Show cool youtube physics roller coaster videos explaining this law. Talk about gravity (you have to “overcome” gravity to make the marble go upside down in a loop!)
Explain what a loop, hill, and corkscrew are (show pictures/point them out in the video)
http://www.superchargedscience.com/documents/RollerCoasterPhysics.pdf

Setup:
Pipe insulators
Marbles (for testing)
Duct tape
Bucket and water (for demo)
Chairs and other props found in the room

Kids set up in groups 3-4. They will use the pipes to make their own roller coaster!

Third graders will make one big hill and one loop.
Fourth graders make one loop, one big hill, and one corkscrew.
Fifth graders make one loop, one corkscrew, and two big hills.

Test the roller coasters out with marbles.

- Is the marble jumping over the track wall? Increase your bank angle (the amount of twist the track makes along its length).

- Does your marble just fall out of the loop? Increase your marble speed by starting at a higher position.

- When all else fails and your marble still won’t stay on the track, make it a tunnel section by taping another piece on top the main track. Spiral-wrap the tape along the length of both pieces to secure them together .

They will have to decide the limit for how big they can make the hill and without the marble falling out. They will also have to determine how big to make the hill so the marble goes through the loop and/or over the hill. Leave time for all the kids to present their roller coasters to everyone.

For the second week, if the kids finished testing and showing their coasters to everyone, the kids will make a different roller coaster design. Maybe switch up the groups. If the kids found the first week easy, tell them to add an extra loop or corkscrew into their new design! If they didn't finish the first week, they will continue working on it for the second week.