Midway Physics Day

Department of Physics and Astronomy

University of South Carolina

SOUTH CAROLINA State Fair

USC South Carolina

Outline

- Midway Day Description
- Practical Considerations
  - Preparing a lesson plan
- Executing Midway Day Successfully
  - Discussion

USC Physics Demonstrations Location

USC Physics Mentors

We work with students and teachers!

USC Midway Agenda

- 9 -11 am Set up tent, mentor teams
- 11-12 Midway morning fun
  - » check-in and hands-on demonstrations
- 12-2 pm Ride and Mentor

What is YOUR schedule?
Plan activities for the bus ride to and from the fair.
Plan lunch time meeting – analysis, group coordination.
Plan some free time for the students.

Demonstrations 11-noon

Plan activities related to the demonstrations.
Ex: Students must participate in and explain 2 demos.

- Rotating platform
- Vibrating springs
- Singing bars
- Bouncing Balls
- Jumping Rings (Electromagnetic Forces)
- Eddy Currents (Magnetic Braking)
- Polaroid Sheets
- Liquid Nitrogen Demonstrations
- …

Have students participate in demos while you check in.
Use the Academic Avenue Stage as “home-base”

Preparing a Lesson I

- Choose only a few rides to analyze
  - Many distractions at the fair, don't overreach
- Prepare with students before arrival
  - Have practice sessions in class
- Make sure students can do everything before/at the fair
  - Bring enough printouts
  - Bring calculators, pencils, protractors…

Preparing a Lesson II

- Plan a lesson in line with your course objectives and student abilities
  - Keep it simple

- Budget time so students are successful
  - Arrive early and prepared
  - Use the bus ride for instruction/preparation
  - Use the lunch period to regroup and finish problem sets

Measurements can be detailed or estimated

- Ferris Wheel

  Measure the height of the ride with protractor or via air pressure.
  Measure the period/frequency of rotation.

- Roller Coaster

  Newton's Laws (What forces are involved on the ride)
  Conservation of Energy (Height of Hills)

- Drop of Fear (Magnetic Force Braking)

  Measure the free fall time. Calculate the speed.

  Measure the height of the ride.

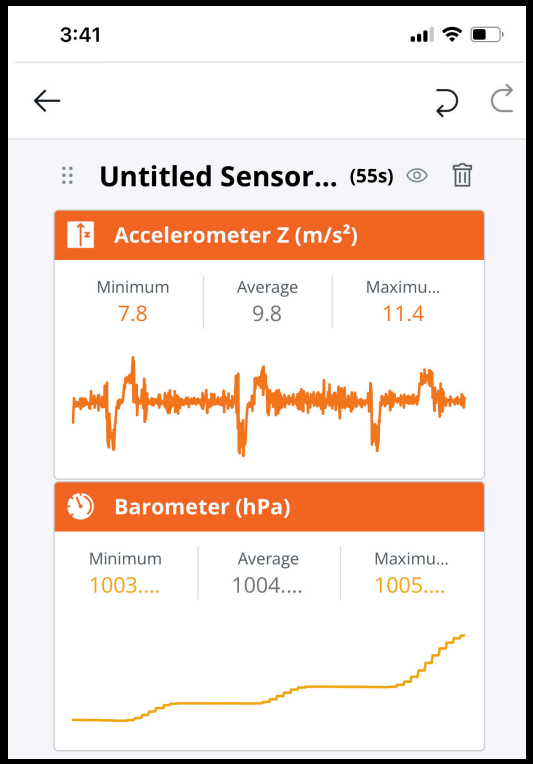
- Starship 2000

  Circular Motion (Can measure ride radius and time period to get acceleration – compare with measurement)

There's an App for That

Use your smart phone's sensors to take data at the fair!

https://www.arduino.cc/education/science-journal



Dr. Dave's Elevator Ride

Accelerometer allows for investigation of forces

Measure height through air pressure reading

SC Educational Standards

Standard H.P.1: The student will use the science and engineering practices, including the processes and skills of scientific inquiry, to develop understandings of science content.

Standard H.P.2: The student will demonstrate an understanding of how the interactions among objects and their subsequent motion can be explained and predicted using the concept of forces.

Standard H.P.3: The student will demonstrate an understanding of how the interactions among objects can be explained and predicted using the concept of the conservation of energy.

Roller Coaster Activity

Problems:

- Why is the second hill shorter than the first?

- Assuming no friction how much potential energy was stored on the first climb?

- Determine the gravitational potential energy on the second hill.

- Label the sections on your sketch that represent the greatest kinetic energy.

- Determine the average and the maximum velocity of the ride.

- Where does the maximum and minimum acceleration occur?

- Compare the calculated acceleration with the acceleration you measured with an accelerometer.

Printed Resources

- Teacher's Guide
- Sample Worksheets
- http://go.sc.edu/midwayphysicsday
- http://boson.physics.sc.edu/~wilson/midway/teachingmaterials.html
- https://ed.sc.gov/sites/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf

Final Thoughts

Midway Physics Day is a fun and effective way to motivate your class about science.

Thanks to

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