***Experiencing the scientific process by investigating spinning tops***

FACILITATION TIPS

**Note to Instructors:** This sheet is intended to provide reminders during facilitation of the activity. Please review the module text before teaching.

1. Introduction
   1. Contexting
      1. Focus of activity is on the scientific process
      2. Using inquiry
         1. Instructors will help, but do not know the answers
         2. You will ask your OWN questions and carry out your OWN investigation
         3. Mirroring authentic science practices
      3. No prior knowledge of spinning tops necessary
      4. Working in groups (expectation of equal participation)
      5. Timeline and steps students will take (numbers 2 - 9 below)
2. Brainstorm
   1. Contexting
      1. Parts of a spinning top (spindle, body)
      2. All ideas will be recorded, no bad ideas
   2. On-the-fly
      1. If necessary, nudge students towards including weight, height of base along the spindle, and symmetry in the list
      2. Be wary of misleading ideas (e.g. color), ask students why they expect that factor to affect the top
3. Testable questions
   1. Contexting
      1. what will you measure?
      2. change one variable
4. Planning the investigation
   1. Contexting
      1. Facilitators show materials
      2. Tell students to respect materials, must put them back at the end
      3. Required: drawing of planned tops, materials list, set-up data table
      4. Change one variable
      5. Timeline
5. Investigation
   1. Contexting
      1. Create tops first, then request a stop watch from facilitator
      2. Spin tops on paper, not on table
      3. Remember to use your data table
      4. Write down other observations
      5. Timeline
   2. On-the-fly
      1. Make sure students are changing one variable at a time
      2. Make sure students are recording data
      3. Be sure data can be used to answer their question
      4. Periodic time checks
6. Clean up
7. Interpreting data
   1. Contexting
      1. What do the data show?
      2. Expected or unexpected? why?
      3. What other conclusions can you draw based on your observations?
      4. Remind students that they will be sharing their conclusions, write them down
   2. On-the-fly
      1. Make sure students use data to support their conclusions
      2. Discuss reasons for unexpected results (results that don’t align with known principles in physics)
8. Sharing conclusions
   1. Contexting
      1. Expectation that students will be respectful when others are speaking
9. Reflecting on the process
   1. Share
      1. You just engaged authentic scientific practices
      2. Science can be frustrating
      3. These investigations give you an opportunity to study whatever you want (e.g. do a science fair project!)