

Lesson Update and CRT Addendum	
Lesson/Activity Title: Microgravity Educator Guide: Surface Tension-Driven Flows.	ID: 6-484
Product Number: EG-1997-08-110-HQ	Grade: MS
URL for Lesson: https://www.nasa.gov/pdf/315964main_Microgravity_Surface_Tension.pdf	
Subject: Surface tension, surfactants, and the effects of gravity	
Summary: Students explore surface tension and surfactant effects in various hands on activities.	
Materials for Lesson: Lesson has detailed materials list for each activity.	

Review and Recommendations	
ALIGNMENT TO STANDARDS	
NGSS	MS-LS1-1, MS-LS1-3, MS-LS2-1, MS-LS2-3, MS-LS2-4, MS-ESS2-1, MS-ESS2-2, MS-ESS2-4, MS-ESS3-2, MS-ETS1-2, MS-ETS1-3, MS-ETS-4
Common Core State Standards in Mathematics	
CULTURAL RESPONSIVE TEACHING (CRT) RECOMMENDATIONS	
5E Lesson/Description	
1. Engage	<p>The activity begins on pg. 114 of the Microgravity packet. Ask if students have ever been in a fast elevator, on a roller coaster, or in an airplane and felt weightless.</p> <p>Packet has good introductory material that begins on pg. 1 and continues through pg. 69. Teachers can get as in depth as students are capable of handling on the myriad aspects of microgravity and all of the types of research performed.</p> <p>A strong focus should be placed on vocabulary (pg 71-73).</p>
2. Explore	<p>For younger students or those with fewer resources there is another similar activity that can done with whole milk, food coloring, a toothpick, dish detergent, and a petri dish (or other clear flat container). It goes by many names: Milk Rainbow, Magic Milk, Tie-Dyed Milk...</p>

	Where possible, allow students to explore and discover through the activities and present the “answers” only after students have had the opportunity to think and collaborate.
3. Explain	Always give students the opportunity for open-ended discussion before giving reading assignments and before engaging in the activities. I.e., what will the needle do when soap is introduced? WHY?
4. Expand/Enhance	<p>Students can be allowed to redo the activity introducing variables to either speed up or slow down processes. Variables can be student driven or provided by teacher in lower level classes (temperature, various solutes, track shape...) Students can race each other’s’ designs for most rapid movement of color.</p> <p>Another fun activity that can be done on the serious cheap is Drops on a Penny. That activity is included in the resources section.</p>
5. Evaluate	Students could write up their observations in a lab report, a quiz, or collaborative “quick write” can be a summative assessment. Formative assessment should be applied throughout discussions and activities.

Additional Resources:

Milk:

<http://www.scientificamerican.com/article/surfactant-science-make-a-milk-rainbow/>

<http://www.nipissingu.ca/education/jeffs/4284winter/pdfs/magicmilk.pdf>

<http://www.coolspace.org/CoolScience/KidScientists/tiedymilk.htm>

Drops on a Penny:

<http://www.stevespanglerscience.com/lab/experiments/penny-drops/>

http://www.sciencebuddies.org/science-fair-projects/project_ideas/Chem_p021.shtml