

Global Trade Teacher Guide

Science in Context



Integrating Global Trade & Logistics into your Science Course

Students love to learn in context – it’s a great way for them to see the tangible use of their standards based classroom concepts. In this teacher guide we will familiarize you with the pre-made science modules you might use as an introduction to global trade concepts in your course.

Overview of Academic Modules for Science

Module	Assignment	Description	Standards	Pages	Page #
Global Trade Culture & Travel – Multidisciplinary Unit or Stand Alone Science Modules	Corporate Social Responsibility	Corporations are beginning to implement a triple bottom line, considering more than just finances in their corporate policy	Multi-Discipline Background Reading	4	141
	The Science of Global Social Responsibility	Calculation of Carbon Footprint on a Business Trip	NGSS DCI Connections ESS2.D, ESS3.A, ESS3.C, ETS1.B	4	145
	Global Protocol	Business Etiquette around the world can vary significantly. This overview of business protocol and cultural awareness is an introduction to global travel.	Multi-Discipline Background Reading	2	123
	Career Spotlight – Monica Rosas The Benefits of a Bicultural upbringing	Students read about the benefits of a bicultural upbringing in this career spotlight	Multi-Discipline Background Reading	2	149
Fresh Fruit For All Science Module	Fresh Fruit For All Banana Logistics Background	The logistics of getting fresh fruit from tropical countries where they can farm year round to our local grocery store	Multi-Discipline Background Reading	4	95
	Fresh Fruit For All A Study of Fruit Ripening	Lab 1: Design an experiment to ripen bananas Lab 2: Determine the ripeness of an apple through starch testing	NGSS Standards HS-PS1-5, HS-PS1-6 HS-LS1-6, HS-LS2-8 HS-ETS1-1, HS-ETS-2	6	99 102

Corporate Social Responsibility

Calculating your Carbon Footprint

Assignment Overview

Students are tasked with setting up a business trip. First they research the cost of the trip in dollars and tons of carbon, at high and low carbon/cost options. They must compare different options for flights, hotels and rental cars and comparing the carbon footprint depending on the choices they make so they can see the vast difference we can make through small choices in our everyday life.

Activity	Corporate Social Responsibility
NGSS Covered	<p style="text-align: center;">NGSS DCI Connections</p> <p>ESS2.D Weather & Climate: Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (PE: HS-ESS3-6)</p> <p>ESS3.A: Natural Resources All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (PE: HS-ESS3-2)</p> <p>ESS3.C: Human Impacts of Earth Systems The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (PE: HS-ESS3-3)</p> <p>ETS1.B: Developing Possible Solutions When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. PE's: (secondary to HS-ESS3-2),(secondary HS-ESS3-4)</p>
Objectives	Students will set up a business trip, calculating the carbon footprint of each step of their journey.
Estimated Time	<p>Assignment 1: Background & Case Study: Corporate Social Responsibility One 30-45 minute class period</p> <p>Assignment 2: Carbon Footprint Activity One 45-60 minute class period</p>
Materials	Each group will need access to a computer or tablet for the background reading/case study assignment as well as the carbon foot print calculation activity
Extension & Application	<p>You may also choose to have students read the background reading on Global Protocol from CareerAcademics.org (or from the curriculum booklet if you have one)</p> <p>The Career Spotlight on Monica Rosas is a great way to gain interest with your multicultural students as it highlights the benefit of being multicultural.</p> <p><i>CSR CASE STUDIES</i> http://www.gbta.org/Lists/Resource%20Library/GBTA%20Toolkit/GBTA%20Too</p>

	<p><u>lkit revised DR9.pdf</u> Want to read more about offsetting your carbon impact? <u>http://www.theguardian.com/environment/2011/sep/16/carbon-offset-projects-carbon-emissions</u></p>
References	<p><u>http://www.statista.com/topics/962/global-tourism/</u> <u>https://www.linkedin.com/pulse/environmental-impact-business-travel-dan-ruch</u> <u>https://en.wikipedia.org/wiki/Corporate social responsibility\</u> <u>http://www.gbta.org/Lists/Resource%20Library/GBTA%20Toolkit/GBTA%20Too</u> <u>lkit revised DR9.pdf</u> <u>http://www.gbta.org/Lists/Resource%20Library/GBTA%20Toolkit/GBTA%20Too</u> <u>lkit revised ES.pdf</u></p>

Fresh Fruit for All

Providing unblemished ripe fruit to the store all year long

Assignment Overview

In this assignment students study the logistical considerations when transporting goods such as fruits and vegetables across thousands of miles in order to get a perfectly ripe piece of fruit to the grocery store any time of year. Students complete two lab tests. In the first experiment they put three bananas in different environments for a week and analyze their ripeness daily. They compile and analyze class wide data. In the second experiment you will cut a selection of apples in half and students will test for starch using an iodine test. As fruit ripens the starches break down into sugars, so the more starch present, the less ripe the apple. Students will be able to put the class wide apple selection in ripeness order based on starch content.

Activity	Fresh Fruit for All
Standards & Objectives	<p data-bbox="367 726 769 762">Chemistry Connections</p> <hr/> <p data-bbox="367 772 1446 877">HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs</p> <p data-bbox="367 919 1349 989">HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.</p> <p data-bbox="367 1031 667 1066">Chemistry Objectives</p> <p data-bbox="367 1068 1446 1287">There are a number of things that can be done to change the rate of a reaction. The Carbon Dioxide in the container can inhibit ethylene production,. In this case, by reducing the amount of ethylene present there is decreased production of amylase and other chemicals that increase the rate of spoilage. Read more in depth about this process at http://ucce.ucdavis.edu/files/datastore/234-267.pdf</p> <p data-bbox="367 1329 1438 1514">Chemical agents have an essential role in biological processes. Biochemistry is an important field of study, because chemical processes are integral in any living thing. Starches are a macromolecule that can be broken down by an enzyme like amylase into sugars. This is the reaction that occurs in fruit ripening.</p> <p data-bbox="367 1556 724 1591">Biology Connections</p> <hr/> <p data-bbox="367 1602 1414 1707">HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.</p> <p data-bbox="367 1749 1406 1818">HS-LS2-8 Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.</p> <p data-bbox="367 1860 626 1896">Biology Objectives</p>

	<p>Starches are large macromolecules found in many plants. Fruits have many starches early on. A chain of biological reactions is started when the plant is damaged which causes the ethylene hormone to be produced which then stimulates amylase production. This enzyme breaks down the starches</p> <p>Engineering Connections</p> <p>HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.</p> <p>HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p> <p>Engineering Objectives</p> <p>Designing an experiment is a key part of acting as a scientist and engineer. By analyzing the global challenge of getting fruit from farm to table while crossing oceans, mountains and more, you will challenge yourself to creating solutions just like people do in real life. Many businesses rely on scientific skills or procedures and it is essential that they have leadership and management in place who can understand and manage these logistical situations. Engineering is solving problems using science & math, and it is essential to many different jobs, including positions like this in international business!</p>
Estimated Time	<p>Background reading & review questions: 20-30 minutes</p> <p>Experiment 1: Banana Ripeness</p> <p>Day 1: Experimental Design: 20 min</p> <p>Day 2: Experiment Set Up: 20 min</p> <p>Day 3-4 Daily Analysis: 10 min</p> <p>Day 5: Completion of experiment & analysis 30-45 min</p> <p>Experiment 2: Apple Ripeness</p> <p>1 day experiment for 30-45 minutes</p>
Extension & Application	<p><i>Great article on the history & science behind fruit ripening</i></p> <p><i>The Origin of Fruit Ripening</i></p> <p>http://www.scientificamerican.com/article/origin-of-fruit-ripening/</p> <p><i>A web post on the iodine ripening test</i></p> <p>https://grousemfarm.wordpress.com/tag/starchiodine-test/</p>
References	<p>http://www.sandiegouniontribune.com/news/2012/aug/14/port-extends-dole-lease-2036-marine-terminal/</p> <p>http://www.scientificamerican.com/article/origin-of-fruit-ripening/</p> <p>http://www.sciencebuddies.org/science-fair-projects/project_ideas/PlantBio_p009.shtml#background</p> <p>http://www.virtualsciencefair.org/2010/kannxc2</p> <p>http://botany.org/bsa/misc/mcintosh/ripe.html</p> <p>https://grousemfarm.wordpress.com/tag/starchiodine-test/</p> <p>http://www.omafra.gov.on.ca/english/crops/facts/00-027.htm</p> <p>http://www.bls.gov/oes/current/oes113071.htm</p> <p>http://study.com/articles/Transportation_Storage_and_Distribution_Manager_Duties_Outlook_and_Salary.html</p>

	<p><i>GREAT VIDEO:</i> http://www.dole.eu/dole-earth/videos/banana-story.html https://www.youtube.com/watch?v=HnbjSaom1AY http://agritech.tnau.ac.in/horticulture/fruit_ripening.pdf http://brokenssecrets.com/2010/02/03/how-to-accelerate-and-slow-banana-ripening/</p> <p><i>Very in depth discussion of elements in each portion of the banana plant as well as the effects of ion deficiencies for each ion</i> http://www.ctahr.hawaii.edu/nelsons/banana/ripeningbunchmanagement.pdf</p> <p><i>Interesting piece</i> http://worldtradedaily.com/2012/08/23/bananas-hs-code-0803-import-export-profile-of-global-and-u-s-trade/</p> <p>Dole shipments: https://www.youtube.com/watch?v=dBcyDIhbNes</p>
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Materials

Supplies needed for 10 lab groups	Quantity	Company/Item#	Approximate Cost
Green Bananas	30	Grocery Store	\$10-20
Post-It Notes	40	Varies	\$1-5
Butcher Paper	2	See your ASB	
Apples *Try to get them at various stages of ripeness	10	Grocery Store	\$5
Iodine-Postassium Iodide Solution	30mL	Carolina #869053	\$6
Spray Bottle	1	Varies	\$1
Various items to help in student experiment: Paper bags, plastic bags, dark cabinets, baking soda & vinegar to make CO ₂ , plastic containers, heat lamps, ice packs			

*Talk to your local grocer to see if they will donate apples and bananas for your lab!

Preparation Experiment 1

Buy your green bananas the day before or the morning of your experiment. Since students will be comparing their changes in ripeness, it would be ideal for you to buy them at the greenest possible point so talk to your grocer to see if you can get some that are super green. It would also be preferable for them to all be from the same batch of bananas.

You will want to provide students with a variety of things they can use for their experiment. This could include but shouldn't be limited to brown paper bags, plastic bags, Tupperware bins, vegetable bags, cloth bags, additional fruits or vegetables, spray bottle of water. Since CO₂ inhibits ripening you may also provide baking soda & vinegar so students can produce CO₂. Have them do the reaction in a sealed bag and use a straw to funnel the gas into your banana's environment.

Preparation Experiment 2

You will want to buy apples at various stages of ripeness. If possible, ask your grocer if they have some that are unripe and not out on the floor, and try to pick some apples that seem past their prime (the grocer might be willing to give you some that they can't sell!).

The Iodine-Postassium Iodide solution should be put in a spray bottle. You can find a small spray bottle for hair products in the travel section, and this might be the most controllable option.