Writing Across the Content Areas - Science - Grade 10

Standard: 3.2. Inquiry and Design

C. Apply the elements of scientific inquiry to solve problems.

1. Generate questions about objects, organisms and/or events that can be answered through scientific investigations.
2. *Evaluate the appropriateness of questions.*
3. Design an investigation with adequate control and limited variables to investigate a question.
4. *Conduct a multiple step experiment.*
5. Organize experimental information using a variety of analytic methods.
6. *Judge the significance of experimental information in answering the question.*
7. Suggest additional steps that might be done experimentally.

D. Identify and apply the technological design process to solve problems.

1. *Examine the problem, rank all necessary information and all questions that must be answered.*
2. *Propose and analyze a solution.*
3. *Implement the solution.*
4. *Evaluate the solution, test, redesign and improve as necessary.*
5. *Communicate the process and evaluate and present the impacts of the solution.*

Enduring Understanding/Big Idea

Elements of scientific inquiry work with a design process to solve problems

Unit Essential Question

How does scientific inquiry interact with the design process for problem-solving?

Task

Scenario	
G	Your goal is "To determine if it is cheaper to ship frozen bananas (using the insta-freeze process) than it is to ship raw ones."
R	You are an intern team member with the Batelle Corporation.
A	Your audience is the special projects team leader who must decide if your team has done well enough to be paid for the balance of its summer internship.
S	Your five team has been established to independently tackle this problem, solve it and write a recommendation.
P	You will produce a plan of inquiry, an accurate solution and a written recommendation.
S	You will be judged on accuracy, communication and problem design using a scientific inquiry design model

Narrative for student

NASA, in furtherance of its efforts to provide life-support for long-term space travel, has discovered an incredibly inexpensive way to use liquid nitrogen to instantly freeze fruits and vegetables. The process called INST-FREEZE or IF has been shown to preserve the taste and texture and nutritional value of raw foods likes potatoes and bananas.

Being a government discovery, the IF process has not been patented and it has been made available to commercial firms in hopes that their experimentation with it will lead to even more domestic uses.

One entrepreneur is considering using it to IF 'peeled' bananas on the banana plantation where they would be packaged and shipped to their destinations all over the work.

To make this monetarily feasible he has to determine if the cost of shipping the frozen bananas is less than the current cost of shipping bananas in 'hands' after they are cut.

Your company, the Batelle Corporation, is known worldwide as a problem-solving firm. Among Batelle's achievement is the elastic six-pack holder that has replaced paper boxing for cans in much of the world.

Batelle has been contracted to determine the answer to the problem above and render a written recommendation to the entrepreneur. Your five teams have been established to independently tackle this problem, solve it and write a recommendation.

Rubric

Area	Proficient 3	Advanced (all of Proficient Plus) 4
Accuracy C2 D2	Math and result are correct	Math and result are correct and work is shown
Communication C6 D5	Report is written	**Report is written accurately answering the initial question**
Design for problem-solving C4 D1 D3 D4	Project design works	Project design is worked out on paper before it is done in actual practice

The Banana Scenario

NASA, in furtherance of its efforts to provide life-support for long-term space travel, has discovered an incredibly inexpensive way to use liquid nitrogen to instantly freeze fruits and vegetables. The process called INST-FREEZE or IF has been shown to preserve the taste and texture and nutritional value of raw foods likes potatoes and bananas.

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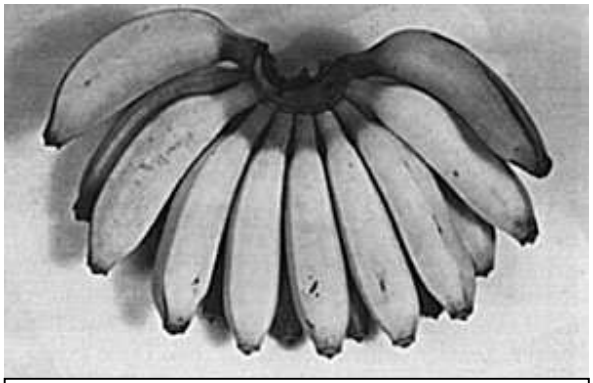

A 'hand' of raw bananas cut at a plantation.

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NASA reports that the IF process adds .005 to the weight of each copper unit of the foods it is used on. This caused by nitrogen absorption.

The Shipping Industry Journal reports that the current cost of shipping raw bananas is known to be .0002 per copper unit. The price of shipping frozen items is .00025 per copper unit (only slightly more due to energy efficient refrigeration costs).