Hands-On STEM Integration:
An Egg-Cellent Engineering/Math Challenge

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Who I Am

➔ Professor of Practice in Teaching, Learning, & Technology @ Lehigh
➔ Instructional designer & educational technologist
➔ Designer of integrated STEM & agriculture curricula
Agenda

➔ The Problem - Kids need STEM and agricultural literacy
➔ The Solution - Integrate the curriculum
➔ An Egg-Cellent Activity - Engineering + Math + Science
➔ The Results - Inquiry, Learning, and Fun!
The Problem
Kids need STEM literacy.
They need agriculture, too.
2019 NATIONAL AGRICULTURE IN THE CLASSROOM CONFERENCE
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The Solution
https://tinyurl.com/y6p9vhwh
<table>
<thead>
<tr>
<th>NAFO</th>
<th>FFSL</th>
<th>CCSS</th>
<th>NGSS</th>
<th>STATE</th>
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<tbody>
<tr>
<td>Gain Awareness of Global Interconnectedness:</td>
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<tr>
<td>Culture, Society, Economy &amp; Geography:1. Provide examples of agricultural products available, but not produced in their local area and state.</td>
<td>4.S.IV.D.1. Students will explain why nations trade products and services.</td>
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<td>5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.</td>
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<td>3.4.4.D3. Investigate and assess the influence of a specific technology or system on the individual, family, community, and environment.</td>
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<td>Acquire Conscientiousness of the Future:</td>
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<td>Agriculture and the Environment:4. Identify land and water conservation methods used in farming systems.</td>
<td>4.S.III.D.1. Students will explain how technological advancements enhance Food and Fiber Systems’ efficiency.</td>
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<td>4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.</td>
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<td>3.4.4.B3. Explain why new technologies are developed and old ones are improved in terms of needs and wants.</td>
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<td>Identify Applications of the Subject(s) in Practice:</td>
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<td>Science, Technology, Engineering &amp; Mathematics:4. Provide examples of science being applied in farming for food, clothing, and shelter products.</td>
<td>4.S.I.E.1. Students will examine the changes in Food and Fiber Systems due to technological advances, and subsequent changes in occupational opportunities. They will identify agricultural careers and how they have changed.</td>
<td>4.MD.A.3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems.</td>
<td>4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.</td>
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<td>Design Models, Diagrams, and Drawings:</td>
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<td>Food, Health, and Lifestyle:2. Diagram the path of production for a processed product, from farm to table.</td>
<td>4.S.V.B.1. Students will identify the six basic food nutrients: carbohydrates, protein, water, vitamins, minerals, and fats. They will categorize foods based on nutritional content.</td>
<td>4.NF.B.3.D. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.</td>
<td>5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.</td>
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<td>3.1.4.B5. PATTERNS. Identify observable patterns in the physical characteristics of plants or groups of animals.</td>
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➔ Relevant
➔ Engaging
➔ Authentic
➔ Scaffolded
➔ Practice-Oriented for competency development
How will you help Farmer Kathy prepare for the farmers’ market?
KnowASTE knowledge

ThinkASTE attitudes

PBL Tasks skills
An Egg-Cellent Activity
Driving Question

How will you safely transport four eggs from the farm to the farmers’ market on a bumpy truck ride?
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eMpathize

Define

IdeaTe

Prototype

Test
Getting eggs to the farmers’ market in one piece is going to be a real challenge – especially since there are no egg cartons on the farm. You and your team will have to design a new way of transporting the eggs to the market without breaking them. What will you use? How much will it cost? And how will you do it?

Using materials you find around the farm, you will design an egg transport system to get four eggs safely to the farmers’ market. There are three things you must keep in mind when designing your transport system:

- Cost Effective
- Clean & Sanitary
- Environmentally Friendly
empathize

review personas
Monica, 25

DEMOGRAPHICS

Marital Status: Single
Education: Masters Degree
Job Title: Marketing Executive

BEHAVIORAL IDENTIFIERS

Incredibly successful young professional who cares deeply about others and the environment. Does most grocery shopping online.
Susan, 37

DEMOGRAPHICS

Marital Status: Married with 4 kids
Education: Associates Degree
Job Title: Stay-at-Home Mom

BEHAVIORAL IDENTIFIERS

Wants to feed her family well, but with 4 kids, things must be easily prepared, quick, and pre-cleaned. Does some gardening on her own.
Frank, 68

DEMOGRAPHICS

Marital Status: Widowed
Education: High School
Job Title: Retired

BEHAVIORAL IDENTIFIERS

Living on a small pension and Social Security income. Very concerned about the rising costs of living and expenses. Relied on his wife to cook.
define

review other designs
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fvallera@gmail.com
ideate

consider materials and solutions
prototype

with low and high fidelity
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test

on a bumpy truck ride
reflect

on math and design
The Results
- Soil
- Sticks
- Feed Bags

- Corn Feed
- Wood Shavings
- Straw

- Newspaper
- Feed Bags
- Baling Twine

* Responses are subjective.
Student 1: Look, here’s soil! It’s free.
Student 2: Yeah, but it’s dirty.
Student 1: So. Shouldn’t we get the cheap and free stuff?
Student 2: Yeah, but it has to be clean and environmentally friendly.
Student 3: Do you want to buy dirty eggs?
Student 1: No....Here’s burlap! It says it’s free, too and it looks clean....
Questions

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