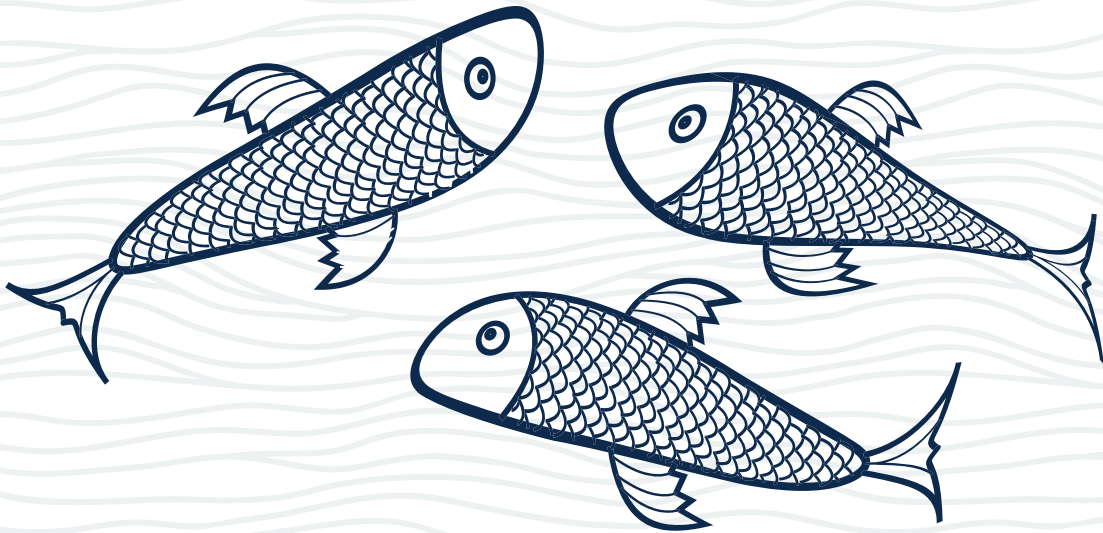
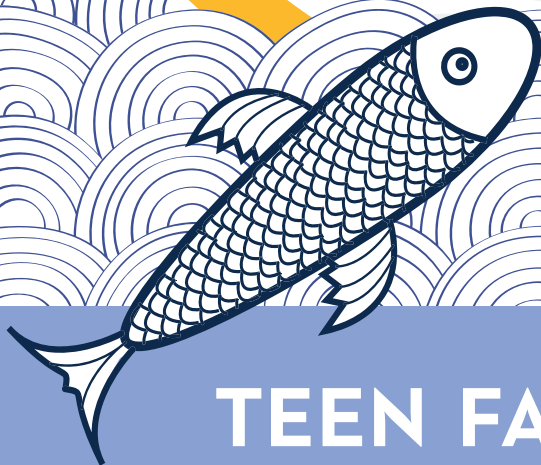


Fish Farm CHALLENGE



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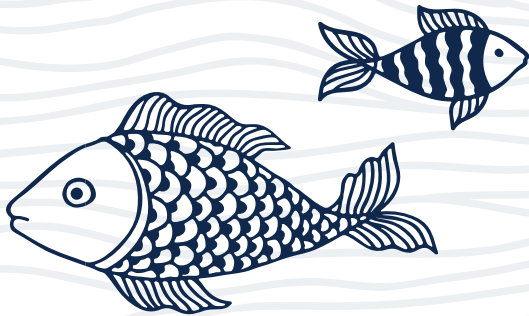


TEEN FACILITATOR GUIDE

KEY OBJECTIVES:

- Recognize the **value of aquaculture** as a sustainable practice for addressing food security, especially in developing countries with large coastal communities.
- Discover how **engineered solutions** can be used to optimize certain aquaculture operations, thereby reducing costs, providing efficiencies, and maximizing one's return on investment.

Estimated Preparation and
Completion Time = 60 Minutes



KIT MATERIALS

Per group of 5 youth



40" x 40" Fish Farm Challenge Mat

2" stack of newspaper

One roll of 2" masking tape (or 1.88" equiv.)

Two 1/2" x 8" pieces of PVC pipe
(for rolling newspaper ONLY-not part
of the solution)

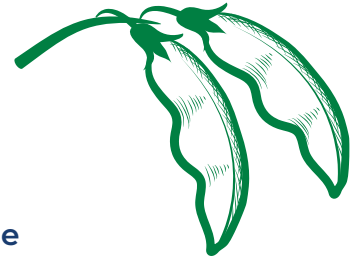
One 200" roll of Gayla kite string

Scissors

2.5 quart disposable paper paint bucket

8" funnel

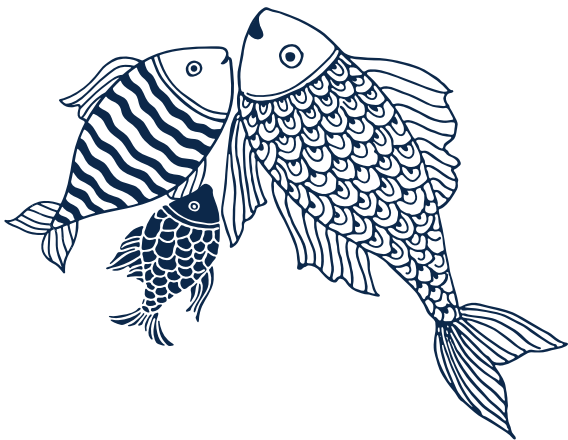
Two-cup ration of soy-based Tilapia fish pellets



FACILITATE THE CHALLENGE

1. Familiarize yourself with the Challenge
2. Organize students into teams of 4-5
3. Describe the Situation

A Midwestern farmer owns a fish farm with 4 recirculating tanks. In her third year of farming fish, she would like to increase her profits. The extra hours in employee wages are costing her money. She also knows Tilapia are fierce competitors for their share of the food, and the larger, more aggressive fish consume the most and experience the greatest rate of gain. To remedy the situation, she is looking for ways to optimize the distribution of food in her tanks so that all fish achieve a more balanced rate of gain. She has contacted your company, Fish Farm Solutions, Inc., to engineer a feeding system to address the issue.



4. Present the Challenge

a. Problem

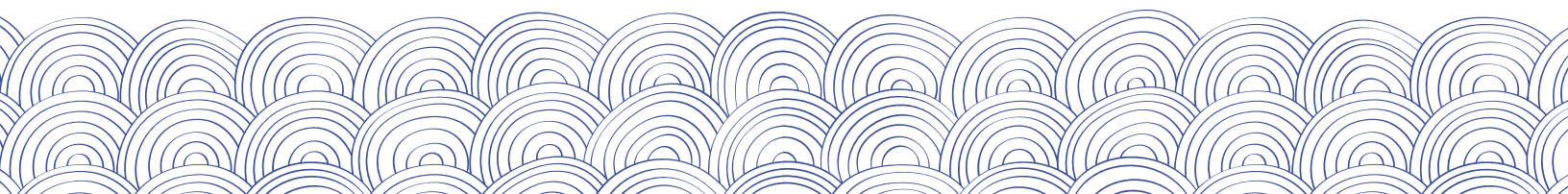
To improve the efficiency of hand feeding fish and to optimize the distribution of food in tanks so that all fish achieve a more balanced rate of gain, you are asked to engineer a prototype that evenly distributes a ration of soy-based fish pellets across the surface of the tank.

b. Materials

Give each team a 40" x 40" Fish Farm Challenge Mat, a 2" stack of newspaper, one roll of 2" masking tape, two $\frac{1}{2}$ " x 8" pieces of PVC pipe (for rolling newspaper ONLY-not used as part of the solution), one 200' roll of Gayla kite string, scissors, 2.5 quart disposable paper paint bucket, an 8" funnel, and a two-cup ration of soy-based Tilapia fish pellets

c. Constraints

Challenge them to assemble a freestanding, hands-free device capable of supporting a two-cup ration of soy-based fish pellets and evenly dispersing the pellets across the surface of the tank which includes 3 target areas. The target areas are marked on the 40" x 40" Fish Farm Challenge Mat that is positioned directly below the feeding device. The device can be secured to the edges of the challenge mat, so long as the device is positioned over the mat and not touching it. Teams must also consider how they will contain the feed so that it does not disperse beyond the challenge mat.



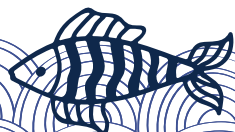
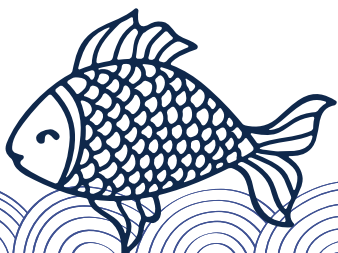
5. Next, have the teams...

a. Ask Questions among themselves

- *Is it important that all the fish get the same amount of food?*
- *How do we keep the larger fish from eating all the food first?*
- *Why does the fish farmer want fish that are all the same size?*
- *What is the best way to divide the feed up so all kinds of eaters get the same amount of food?*

b. Imagine Solutions: brainstorm with their fellow team members

- *Visualize the device positioned over the tank... the Fish Farm Challenge Mat represents the tank. How can we evenly distribute the feed across the surface of the tank including the 3 target areas?*
- *Can we **regulate** how much feed goes into the tank?*
- *Can the force of gravity or a simple machine be used to influence how the feed is distributed?*



c. Decide on a plan

Work as a team to *imagine* the kind of device that properly addresses the challenge. Encourage team members to individually *plan* their design on paper or discuss ideas among themselves. Teams will incorporate their best ideas into a working plan using the supplied materials.

d. Create a Solution: build a prototype

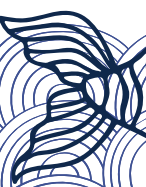
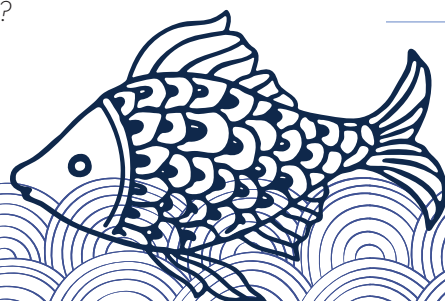
Using only the materials provided, have each team *create* a working prototype. Make sure students understand the *constraints* of the challenge before building the *prototype*.

e. Improve the Prototype: test the solution and refine the design

With the facilitator present, each team will test their design by pouring fish feed into their feeding device. Encourage them to observe how well the device meets the design constraints and make note on what is or isn't working... allow them time to refine their design.

Talk About It

- *Does the device evenly distribute the feed across the surface of the challenge mat including the three target areas?*
- *What did or didn't work? What problem would you like to fix?*
- *What do you need to improve to make your device work better?*



6. Compare the Findings ... Celebrate the Results

When teams have built and tested their prototype, ask the groups to demonstrate their results. Each team should identify one unique feature about their feeding device. Compare and contrast the ideas and discuss how they might incorporate these ideas into one or several group solutions to present to the client.

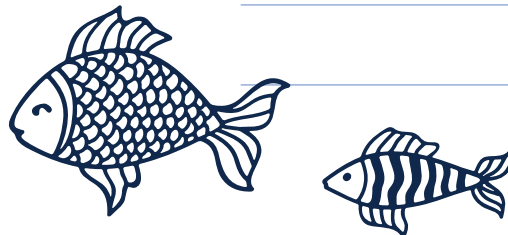
Created by:

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Agriculture and Environmental Sciences, The Ohio State University

Sourcing Kit Materials

- Lowe's - Hopkins 8" Medium Funnel,
Item #: 323299 | Model #: 05009
- Lowe's - Encore 2.5 Quart Touch N Trim
Paper Pail 5T1-500358 Item# 211828
- Lowe's Scotch 1.88-in Painter's Masking Tape,
Item #: 394732 | Model #: 2020CG-48-CP
- Lowe's PVC Pipe 1/2-In x 10-Ft 600 Psi Schedule
40 Pvc Pressure Pipe (cut into 15 8" sections)
- Soy-Based Fish Food Pellets, <http://premiumfishfood.com/tilapia-inter-mediate-pellet.html> (816-343-4745)
- Intermediate Pellet - 10 lb bags (42 cups = 10lbs)
- Gayla Super Twine Kite String, 200 Feet/Pack of
36 Rolls, <http://www.onlinesciencemall.com/gayla-super-twine-kite-string-200-feet-pack-of-36.html>





TEAM DIRECTIONS:

(Duplicate and distribute to each team)

Your Challenge: To improve the efficiency of hand feeding fish and to optimize the distribution of food in tanks so that all fish achieve a more balanced rate of gain, you are asked to engineer a prototype that evenly distributes a ration of soy-based fish pellets across the surface of the tank.

Use only the following materials:

40" x 40" vinyl Fish Farm Challenge Mat

2" stack of newspaper

One roll of 2" masking tape (or 1.88" equiv.)

Two 1/2" x 8" pieces of PVC pipe
(for rolling newspaper only)

One 200' roll of Gayla kite string

Scissors

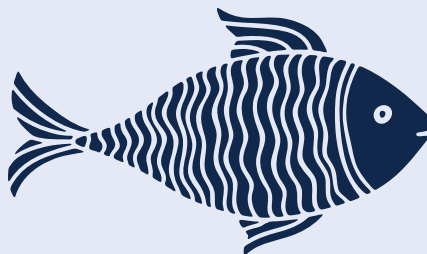
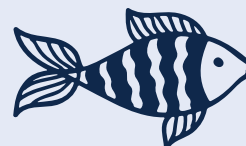
2.5 quart disposable paper paint bucket

8" funnel

Two-cup ration of soy-based fish pellets

THE RULES:

1. Assemble a freestanding, hands-free device capable of dispersing a two-cup ration of soy-based fish pellets evenly across the surface of the tank which includes 3 target areas.
2. The target areas are marked on the 40" x 40" Fish Farm Challenge Mat that is positioned directly below the feeding device.
3. The device can be secured to the edges of the challenge mat, so long as the device is positioned over the mat and not touching it.
4. Teams must consider how to contain the feed so that their device does not disperse beyond the edges of the challenge mat.



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