OHIO STATE UNIVERSITY EXTENSION

STEM PATHWAYS
Ag Bot Animal STEM Challenge!

The Problem

Greg's sons have gone off to college and at age 60 he faces working his livestock alone. He needs to build a new livestock handling system that is cost effective, efficient and safe for him and his livestock.

Your Challenge

To create the most cost effective livestock handling facility to move the ag bots from the corral to the barn safely in the least amount of time.

Find a Solution

ASK: What are some possible ideas?

PLAN: Test out your ideas

CREATE: Put your ideas into action.

TEST: How well did your ideas work?

IMPROVE: Review results & make changes

Things to Consider

1. How does your animal (Ag Bot) move?
2. What handling obstacles will your design need to take into account?
3. How will design materials chosen impact costs, animal behavior and labor?

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Choose Your Design Materials

Tape Strip - $50/each

Straw - $250/each

Stiff Plastic - $500/each

PVC Pipe - $1500/each

Cardstock Strip - $150/each

Popsicle Sticks - $300/each

Tubing - $1000/each

PVC Connector - $750/each

SAFETY ALERT:
Scissors are sharp! Please be careful when cutting!

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FACILITATOR PROCESSING

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TIME: 30 MINUTES

Materials and Supplies

- Masking Tape
- Craft Sticks
- Straws
- Cardstock Strips
- Stiff Plastic Sheet
- Tubing
- PVC Pipes
- PVC Connectors
- Timer
- Calculator
- Hexbugs (3-6) or Similar Micro-Robot

Design Space 4 x 4 ft. area

- PVC pipe for perimeter to keep ag-bots on engineering surface
- Toy Barn Structure(s)
- Hex Bugs or Similar Micro-Robot (3 to 6)
- Stop Watch (time through design)

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Engage the Learner

- How will time through the handling system impact handler safety and success of moving the herd?
- How would shape and texture of materials impact animal movement?
- How would approaching the design from the animal's viewpoint change your approach?

Observations & Conclusions

- What worked? What didn't? Knowing what you know, what changes will you make?
- If you could choose another material, what would it be?
- What might you do differently to improve your handling time by 25% or reduce costs by 25%?

Post who had the best time and most cost effective design to encourage friendly competition.

STEM Career Path … Animal Scientist

- Who else might be involved? *Veterinarians, agriculture systems technologists, agriculture engineers, livestock producers, economists.*
- Who benefits? *Economic benefits to producer, higher quality products for the consumer, improved animal well-being, fewer injuries to animals and humans.*
- What other issues are animal scientists helping to solve? *Improving food quality through management programs that improve animal performance, behavior and care.*

Refer to Career Focus Card for more details.

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career

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Did You Know? Livestock have panoramic vision! How do animal's senses impact the approach to designing a handling facility?

SCIENCE
Animal Scientist

What conclusions can you draw knowing livestock?

- Hear high frequency noise that humans can't. 7,000 to 8,000 Hz versus humans hearing 1,000-3000 Hz.
- Have wide angle vision (300 degrees). We see at 180 degrees.
- Have poor depth perception especially when their heads are up.
- Are dichromats (two-color) being most sensitive to yellowish-green and blue-purple light. We are trichromats and see the full color spectrum.
- Move best from dim to a more lit area, but not into bright light.

TECHNOLOGY
Agriculture Systems Technologist

How can automation benefit handler safety and animal stress?

- Pigs often baulk when approaching an incline. Hydraulic lifts enable load-out chutes to lay flat allowing pigs to walk at one level onto and off of transport trucks.
- Automatic sorting technology is used to feed groups of pigs to mar-ket weight, computer generated data sorts pigs into pens to meet dietary needs and time to load-out to market.
- Automation of squeeze chutes and head gate systems enhance producer safety and handling efficiency.

ENGINEERING AGRICULTURE
Engineer

Which materials will help reduce livestock's flight response?

- Animals panic if they slip, even a little.
- Animals don't like to walk through water, even a puddle.
- Livestock are prey animals, and look for an easy way to escape.

MATH
Agriculture Economist

What cost factors need to be considered?

- A well planned facility can help save money from reduced labor costs, improved efficiency of management practices and reduction in injuries to handlers.
- Interest rates for borrowing money to build a handling system as well as increases from income based on better animal performance from the handling system must be considered in budgeting for any handling system.

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ANIMAL SCIENTIST

Finding Solutions For...

- Systems that improve performance and enhance animal care to reduce injury to humans and animals including facilities and handling systems.
- Improving desirable traits through breeding programs that improve animal growth, reproduction and behavior characteristics.

Job Forecast Looks Like...

- **Median Income:** $61,060
- **Job Outlook:** 9% growth 2012-2022
- **Job Environment:** Work in office and lab settings as well as on-site research with livestock producers, food processors and others.
- **Expected Growth Areas:**
  - Animal health
  - Food security and traceability.

Skill Set Needed...

- **High School Courses:**
  - Math: algebra, trigonometry, and calculus
  - Science: biology, chemistry, and physics
- **Communication:** Need good written and verbal skills to share information with a producers, scientists and consumers.
- **Decision-Making:** ability to know if their findings will have an impact on farm production, agriculture policy and food production.
- **Critical-Thinking:** determine the best approach to a research question.
- **Observation:** precise skills in observing and analyzing data for conclusive and accurate interpretation of results.

Education and Training Required...

- **Entry Level Jobs:** Require Bachelor's degree
- **Additional Training and Certifications:** Earning potential increases with a Master's or Doctorate. Internships are helpful in securing jobs and provide valuable experience.

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Source: U.S. Department of Labor, Occupational Outlook Handbook, 2014-2015 Edition, bls.gov/ooh