

STEM PATHWAYS

AgBot Harvest **STEM** Challenge!

The Problem

The world's population is expected to reach 9 billion by 2050 that's 2 billion more people to feed than we do now. Reducing harvest loss is one way to address the problem. Harvesters will need to operate efficiently at higher speeds with customizable and durable attachments for site specific operations.

Your Challenge

Engineer a device that harvests the most grain in the least time for your site specific operation.

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 (Ag Bot) machine base move?
2. What design will allow your machine to gather the most grain?
3. How will grain, size, shape and weight impact your design?

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Choose Your Design Materials

½ wide Masking Tape

3 ounce Paper Cups

Craft Sticks

Cardstock Strips

Straws

Paper Clips

Toothpicks

Hex Bugs



SAFETY ALERT:

Scissors are sharp! Please be careful when cutting!



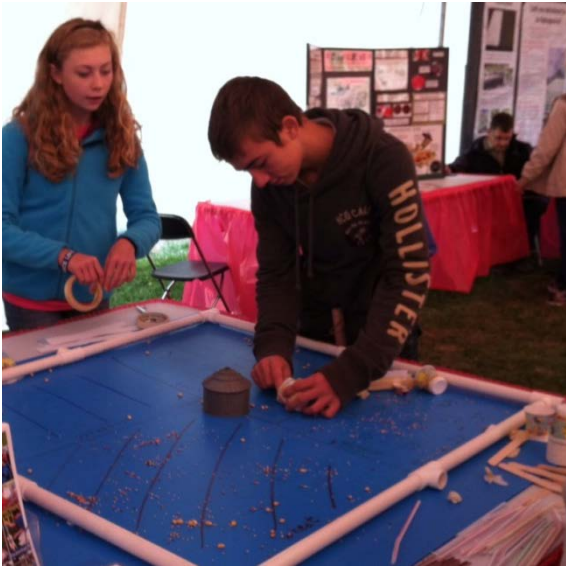
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TIME: 30 - 45 MINUTES

Materials and Supplies

- Masking Tape
- Straws
- Hexbugs (3-6)
- Cardstock strips
- Timer
- 3 oz. Paper Cups
- Craft Sticks
- PVC Pipes
- PVC Connectors

Design Space 4 x 4 ft. area

- PVC pipe for perimeter to keep ag-bots on engineering surface
- Hex Bugs or Similar Micro-Robot (4 to 6)
- Stop Watch (time through design)



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Engage the Learner

- How will you control the machines movement through the field during harvest?
- What materials will assist you in your design to collect the most grain during harvest?
- How will increase “horsepower” effect your harvest goals?

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 harvesting time by 25% or amount harvested by 25%.

Post who had the best time and harvested the most grain.

STEM Career Path ... Agriculture Engineers

- Who else might be involved? *Agriculture systems technologists, economists, agriculture producers, agriculture safety specialists, etc.*
- Who benefits? *Economic benefits to producer, environmental benefits, higher quality commodity for processors and livestock producers.*
- What other issues are animal scientists helping to solve? *Technology application to improve machinery & equipment, storage, processing, natural resources protection, alternative energy sources.*

Refer to Career Focus Card for more details.



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STEM PATHWAYS

career

Ag Bot Harvest STEM Challenge

Did You Know? Global positioning systems allow autopilot tractors and precision documentation of yields, application rates and more.

SCIENCE

Agronomist

How can plant genetics impact harvest yields and equipment?

- Agronomists develop innovative practices and technologies to boost crop yields, reduce pest and weed problems and protect the environment.
- The work with agricultural producers to identify the plant genetics (varieties) and crops that work best under various growing conditions including soil type, terrain, rainfall, available machinery, etc.
- Research focuses on genetics to improve plant structures that can withstand wind damage, pest problems and disease issues.

TECHNOLOGY

Precision
Agriculture
Technician

How can GPS technology help producers maximize yields and minimize resource consumption?

- Collect soil samples, use computer models to study drainage patterns, soil pH, rainfall, map weeds, crop yields and develop crop management plans.
- Precision agriculture technicians use these tools to help determine fertilizer and pesticide applications.
- Crop yield monitors mounted on GPS equipped combines, use satellite technology to map yield differences across the field.

ENGINEERING

Agriculture Engineer

Why is sustainability an important feature to include in new designs?

- The world's population will grow to 9 billion people in 2050 requiring agricultural producers to become more efficient using less land and potentially using new fuel sources.
- Agriculture engineers will continue to work to solve challenges that impact water quality, food security and production, land management and other natural resource issues.

MATH

Finance Officer
(Loans)

What determines how much money a person can borrow towards a purchase like a new combine (car, house, farm, etc.)?

- Farm lenders look at a current debt load as well as income and potential earnings from agricultural commodities being grown.
- Sometimes, lenders will encourage borrowers to look at purchasing used equipment versus new equipment based on income projections and/or past performance.



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Agriculture Engineer

Finding Solutions For...

- Develop bio-fuels and alternative energy sources
- Seek better ways to manage crop inputs and reduce environmental impacts through innovations like global positioning systems (GPS)
- Design storage systems and processes that improve food safety and quality

Job Forecast Looks Like...

- **Median Income:** \$71,090 per year
- **Job Outlook:** 9% growth from 2012-2022
- **Job Environment:** Office, lab and field, overtime hours related to weather impacts, growing seasons, etc.
- **Expected Growth Areas:** High-tech applications to agricultural products, water resource management, alternative energies

Skill Set Needed...

- **High School Courses:**
 - Math: algebra, trigonometry, calculus
 - Science: biology, chemistry, and physics
 - Specialized: drafting, computer science, engineering, robotics
- **Listening:** seek out information from clients, workers and other professionals.
- **Problem-solving:** apply engineering and technology to new circumstances.
- **Systems analysis:** propose solutions that work well with workers, equipment, machinery and the environment.
- **Teamwork:** design solutions involving biological, mechanical or environmental dimensions, work and receive feedback from a variety of backgrounds including agronomy, animal sciences, genetics and horticulture.

Education and Training Required...

- **Entry Level Jobs:** Require Bachelor's degree
- **Additional Training and Certifications:** a degree from an ABET-accredited engineering program, a passing score on the Fundamentals of Engineering (FE) exam, relevant work experience, typically at least 4 years, a passing score on the Professional Engineering (PE) exam



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Sources:
U.S. Department of Labor, Occupational Outlook
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