



Robotics in Agriculture

Middle School Food and Agricultural Literacy Curriculum

Precepts

- B. Relationships
 - B2. Interact and work with others

National Standards

CS.10.01.01.b. Discuss the use of mechatronics (such as lasers and robotics) and their impact on AFNR systems.

NL-ENG.K-12.12 – Applying Language Skills

NS.5-8.2 – Physical Science

NS.5-8.5 – Science and Technology

NT.K-12.2 – Social, Ethical, and Human Issues

Student Learning Objectives

As a result of this **unit** the students will...

Recognize the significance of emerging technology in agriculture.

As a result of this **lesson** the students will...

Identify pros and cons of robotics innovations in agriculture.

Content Outline

- I. Understand the use of robots in everyday life.
- II. Identify pros and cons of *robotics* innovations in agriculture.
 - A. Differentiate between positive and negative aspects of robots by sorting.
- III. Create a new use for *robotics* in agriculture.

Interest Approach

Introduce the concept of robots by asking students to create a robot that does anything in the world that they want. For this activity provide them with various materials that they can use to make their "robots." Some examples might include cardboard boxes, pipe cleaners, newspaper, tin foil, buttons, various hats, markers, tape, etc.

Time

Instruction time for this lesson: 45 minutes.

Resources

National FFA Organization. (2009). LifeKnowledge Online. Retrieved July 9, 2009, from <http://agedlearning.org> — National FFA Organization. (2003). LifeKnowledge Precepts and Signs of Success. — YouTube, LLC. (2009). YouTube.com. Retrieved December 29, 2009, from <http://www.youtube.com>.

Tools, Equipment, and Supplies

Overhead projector/transparencies
Glue sticks – one per 2 students
Scissors – one per 2 students
Computer with access to Youtube.com
Writing Surface
Robot-building supplies (cardboard boxes, pipe cleaners, newspaper, tin foil, buttons, various hats, markers, tape, etc.)
MS.AST.4.2.AS.A – one per student
MS.AST.4.2.AS.B – one per student
MS.AST.4.2.AS.C – one copy, cut out and posted around room
MS.AST.4.2.TM.A – one per teacher
MS.AST.4.2.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in **bold italics**:

Robots

I hope everyone had a fantastic night last night! Unfortunately, mine was only okay because I had to do 20 loads of laundry! Can you believe it? Twenty loads of laundry! Laundry has got to be one of my least favorite things to do. If only I could build a ***robot*** to sort my clothes, put them in the machine, and then finally hang them up in my closet – that would make my life so much easier!

Yes, I would build a ***robot*** for laundry. I wonder if you could build a ***robot*** to do anything in the world, what would you build a ***robot*** for?

Elicit a few responses and then instruct students to make a list at their table.

All those ideas sound very helpful. As a table we are going to be creating a list of all the ideas you could possibly think of for a ***robot***. We will have only 60 seconds to create our lists. Try to get as many things as you can think of on the paper. Remember to use everyone's brains at your table!



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After 60 seconds instruct students to pick one **robot** they would like to create at their table group. Tell them they will actually be building this **robot**.

All right, our time is up! There are some really long lists out there. Next, we have to do something a little difficult. We have to narrow our list down to our favorite **robot** to actually build in few moments. Everyone in your group must reach a conclusion together. Each group can pick only one. When your group has selected your **robot**, put your finger on your nose.

Set up the directions for building the robots. Have materials available for them to use at the front of the room.

Take a look up here! All these supplies are parts to the **robots** you will be building. The main thing we have to remember is that one of our group members will serve as the base of the **robot**. After that you can be as creative as you want with all these **robot** parts.

When you hear the word GO, send one person from each group to the front to gather some **robot** supplies. We will be given five minutes to build your **robot**. Be prepared to share! Questions? Oh, by the way, don't share what your **robot** does with other groups. GO!

After the end of five minutes, give each group the opportunity to share what their robot does. It would be even more fun to have the class try to guess what other groups' robots do based on what they look like.

Let's share our **robots**! As each **robot** makes it way to the front of the room, we will try to guess what it does. Then each group will have 30 seconds to explain their **robot**.

We came up with some great ideas for **robots**. They would definitely make life a little easier for us all.

They have many benefits but they really can't beat a human because they can't think and feel like us. It is important for us to make sure we make connections and build relationships with those around us.

With a partner, make a list of the people you interacted with today. What are their names? Think to yourself – how did you act around them? Why are these people important in your life?

Let's hear about some of your interactions today. Who will share first?

Thanks for sharing, everyone! All this **robot** building is starting to make me wonder about how we use **robots** in agriculture.

Summary of Content and Teaching Strategies

Objective 1. Identify pros and cons of **robotics** innovations in agriculture.

This approach involves showing two different YouTube videos. One video shows a person shearing a sheep and the other shows a robot shearing a sheep. Lead students in a discussion about advantages and disadvantages of both methods. If a video is not available you can lead the discussion without using a video. Be cautious when showing these videos. Sometimes the comments should be hidden in advance as they may be inappropriate for school.

Let's take a look at what shearing sheep typically looks like when a person does it and then what it looks like when a **robot** does it. After watching each video we will then make a list of pros and cons for each method.

Show the YouTube video Walter Peak Sheep Shearing at <http://www.youtube.com/watch?v=Tquot-aR4JJ>.

Create a list of the pros and cons of shearing sheep by hand. Pros might be personal interaction with sheep or checking the sheep for health concerns. Cons might be it is time consuming or laborious work.

Next show the video Robot Sheep Shearing at <http://www.youtube.com/watch?v=6ZAh2zv7TMM>

Create a list of the pros and cons of shearing sheep by robot. Pros might be frees people up to do other things, might get more done, not as hard on the body. Cons might be that the sheep seemed more comfortable with humans.

We just watched a couple of videos that can be the base of our next activity. Besides sheep shearing, **robots** are going to be used in many aspects of agriculture. Imagine a world of agriculture where **robots** are the ones that milk the cows, shear the sheep, weld equipment, pull the weeds, spray herbicides and insecticides, and plant and harvest the crops. **Robots** are used already for some of these things and will be used more and more in the future.



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Distribute **MS.AST.4.2.AS.A** and **MS.AST.4.2.AS.B**. Also have scissors and glue sticks ready for the students to use. For the first step instruct students to cut out all the boxes from AS.B and sort them into either a pro or a con on AS.A. Do not let them glue the pieces on yet.

Each person is receiving two activity sheets and scissors. Hold up activity sheet B. When you hear the word GO, use your scissors to cut out each box. After cutting out each box read the square, and decide if it is a pro or a con. Place the square in the pro or con column on activity sheet A. Hold up activity sheet A. What questions are there? GO!

As students are cutting out their boxes, hang up the big pros and cons from **MS.AST.4.2.AS.C** (3 pages) around the room. Have students sort the papers they cut out into pros and cons on their **MS.AST.4.2.AS.A**. After they have made their own choices, do it together as a class with the larger example at the front of the room with a Go-Get-It e-Moment®. As you are working through it as a class you can ask them to use their glue sticks to make their selections more permanent.

Now that we have all made our choices, let's do this together as a class. When you hear ROBOT, get out of your seat and select one of the papers taped around the room. Notice these are the same pros and cons you have been working on; we are just doing this as a large group now.

Once you have a slip of paper, place in on the pro and con chart at the front of the room. Questions? ROBOT

Help as needed and instruct students to grab a glue stick as they make their way back to their seats. Use **MS.AST.4.2.TM.A** as the key to the pro and con lists. Check and glue as a class.

As we check our list at the front of the room feel free to make any corrections on your list. Glue your pros and cons as we work through it.

Transition into the review.

Robotics is becoming more and more popular with agriculture. We saw today that there are many benefits that **robots** can provide for producers in agriculture. There are also a few cons that **robots** bring.

Review/Summary

As a review, repeat the same activity the students did at the beginning of the hour but have their robot agriculturally related for the ending activity.

It's time to review what we learned today. We are going to be creating **robots** again. This time our **robot** must be related to agriculture. We will still have five minutes to complete our **robots** using all the supplies at the front of the room. Questions?

After five minutes, give students time to share their agriculturally related robots.

Application

Extended classroom activity:

Have students work in pairs or groups to research specific robots used in the agriculture industry. Some examples are the sheep shearer, dairy carousel, robotic welders, Monsanto Petri dishes, or fruit pickers.

FFA activity:

Visit a manufacturing plant where robotic welders are used.

SAE activity:

Have students research ways to use robots in their SAEs.

Evaluation

MS.AST.4.2.ASSESS.A.

Answers to Evaluation

1. Answers will vary. Use pro and con list
2. Answers will vary. Use pro and con list
3. Answer will vary.



Robots in Agriculture

Name _____

Directions: Write out the answer to each question in the space provided.

1. Give three pros to using **robotics** in agriculture.

2. Give three cons to using **robotics** in agriculture.

3. Give one example of a **robot** and how it is used in agriculture.



Pros and Cons of Robotics in Agriculture

PROS	CONS
May be able to work in all weather conditions	New technology is always very expensive
Do not get tired	Might take away job opportunities
Help produce animals and crops more efficiently	Agriculture skills are not the same each and every time so it might be hard to get robots to do jobs correctly
Free up producers to do other tasks	Do not have the ability to feel with emotions
Can work in more dangerous environments without risking health of producers. For example, robots instead of humans can spray harmful pesticides.	Repair cost can be very expensive
In many case robots work much faster than humans	Cannot solve problems as well as humans
More uniform products. For example a robotic welder produces same weld each time.	Lose one-on-one contact with your animals.
More jobs are created for people to repair and design new robots.	In many cases humans still must be there to monitor robots in case of a problem or to start it.
They can be very precise, therefore reduce the amount of seed and chemicals used on fields.	Very high start up cost for producers.



Pros and Cons of Robotics in Agriculture

Directions: Cut out the pros and cons of robots on activity sheet B. Sort them into two categories on this paper. Do not glue them onto the paper until you are instructed to do so.

PROS	CONS



Pros and Cons of Robotics in Agriculture

Directions: Cut out each box. Sort them into either a pro or a con of **robotics** in agriculture by placing it in the proper column on Activity Sheet A.

Can work in more dangerous environments without risking health of producers. For example, robots instead of humans can spray harmful pesticides.	Repair cost can be very expensive
Cannot solve problems as well as humans	In many case robots work much faster than humans
Help produce animals and crops more efficiently	May be able to work in all weather conditions
Free up producers to do other tasks	Do not get tired
Very high start up cost for producers.	Agriculture skills are not the same each and every time so it might be hard to get robots to do jobs correctly
They can be very precise, therefore reduce the amount of seed and chemicals used on fields.	Might take away job opportunities
New technology is always very expensive	Do not have the ability to feel with emotions
Lose one-on-one contact with your animals.	More jobs are created for people to repair and design new robots.
More uniform products. For example a robotic welder produces same weld each time.	In many cases humans still must be there to monitor robots in case of a problem or to start it.

Can work in more dangerous environments without risking health of producers. For example, robots instead of humans can spray harmful pesticides.

Cannot solve problems as well as humans

Help produce animals and crops more efficiently

Free up producers to do other tasks

Very high start up cost for producers

They can be very precise, therefore reduce the amount of seed and chemicals used on fields.

**New technology is always
very expensive**

**Lose one-on-one contact
with your animals**

**More uniform products. For
example a robotic welder
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**New technology is always
very expensive**

**Might take away job
opportunities**

**Agriculture skills are not the same
each and every time so it might be
hard to get robots to do jobs correctly**

**Do not have the ability to
feel with emotions**

**Repair cost can be very
expensive**

**Cannot solve problems as
well as humans**

**Lose one-on-one contact
with your animals**

**In many cases humans still must
be there to monitor robots in
case of a problem or to start it**

**Very high start up cost for
producers**