

Machine Safety Specialists

Grade Level: 4-8

Lesson Overview

Machines help people get work done more quickly and easily than working by hand. But the very power that makes them useful can also make them dangerous. This lesson discusses safety guidelines for machines used on the farm and beyond.

Student Objectives

1. Identify specific safety hazards associated with machines used on farms and elsewhere.
2. Explain at least one safety guideline for six different machines.

Materials

Part 1 – The Grain Drain

- ✓ plastic gallon jug with lid (cut off the bottom of the jug)
- ✓ corn or other grain
- ✓ small (2"-3") toy person (LEGO DUPLO® figures work well)
- ✓ empty container or bucket
- ✓ photo or model of a grain wagon or grain cart

Part 2 - Machine Safety Specialists

- ✓ Pay Attention to Machine Safety information sheet
- ✓ Machine Safety Specialist Cards (laminated in advance if desired)
- ✓ transparency markers (to use with laminated cards)
- ✓ Machine Safety Matching Cards
- ✓ Machine Safety Information Grid
- ✓ Machine Safety I.Q. worksheet

Procedure

Part 1 – The Grain Drain

As an interest approach, conduct a demonstration to illustrate what can happen to someone trapped in a flow of grain:

1. Show students the jug with the open bottom. With the lid firmly attached, turn the jug upside down and fill it with grain. Stand a small toy person on top of the grain.
2. Invite students to predict what will happen when you remove the lid from the jug.



3. Hold the jug over an empty container. Making sure everyone can see the toy person, remove the lid. As the grain flows out, it will pull the toy along with it.
4. Discuss what happened to the toy figure as the grain flowed out. How long did it take for the toy to be engulfed? Would the person have had time to escape?
5. Explain that the scenario they just watched has happened to people who were inside of grain wagons or bins when the grain was unloaded. Show students photos or models of a grain wagon, grain cart, grain bin, and/or grain semi.

Part 2 – Machine Safety Specialists

1. Read aloud and discuss the information sheet Pay Attention to Machine Safety.
2. Divide students into teams of six. Explain that they will work as teams to learn about machine safety. Each student will play the role of a “machine safety specialist,” becoming the team expert on their assigned machine.
3. Distribute to each team: one set of Machine Safety Specialist Cards, one set of Machine Matching Cards, and a Machine Safety Information Grid. *Tip: Store each team’s materials in a resealable plastic bag or large envelope.*
4. Each team member reads a Machine Safety Specialist Card, making notes as they go. Once finished reading, students take turns sharing what they learned.
5. The Machine Matching Cards are shuffled and stacked upside down. Team members take turns drawing a card to match with squares on the Information Grid. If unsure where to place a card, they may consult the team’s expert on that machine. The expert may answer from memory, read aloud the relevant portion of their Machine Specialist Card, or check their notes to help choose a match.
6. When all teams have completed their information grids, display the answer key so teams can check their answers. The team with the most correct matches wins!
7. If time allows, have teams clear their grids and try again with a time limit.
8. To assess student learning, distribute the Machine Safety I.Q. worksheet and ask students to complete it independently.

Extension Activities

1. Have students conduct additional research in order to create machine safety posters or videos. Display or share the finished posters or videos to inform other students of the specific dangers of various machines.
2. Invite a speaker to your classroom to discuss safety, such as an emergency room doctor, insurance company representative, electrician, first responder, etc.

Additional Resources

- ATV Safety Institute <https://atvsafety.org/>
- Cultivate Safety - National Children's Center for Rural & Agricultural Health and Safety <https://cultivatesafety.org/>
- Farm Safety for Just Kids <https://nasdonline.org/7177/o000139/farm-safety-for-just-kids.html>
- Grain Safety <https://nasdonline.org/7156/d002403/grain-safety-background-info-activity-book.html>
- Lawn Mower Safety <https://www.healthychildren.org/English/safety-prevention/at-home/Pages/Lawnmower-Safety.aspx>
- National Education Center for Agricultural Safety (NECAS) <https://www.necasaq.org/>
- Safe Kids Worldwide <http://www.safekids.org/>

Standards

Illinois English Language Arts Standard

RST 1: Cite specific textual evidence to support analysis of science and technical texts.

Illinois Social Science Standard

SS.EC.2.4 Describe how goods and services are produced using human, natural, and capital resources (e.g. tools and machines).

The **M**ultidisciplinary **A**gricultural **I**ntegrated **C**urriculum (mAGic) was created in 2004 under the leadership of the Illinois State Board of Education (ISBE) and the Facilitating Coordination in Agricultural Education Project (FCAE). Funding was made available through the FCAE grant budget from the agricultural education line item of the ISBE budget. This revision, as printed, was developed in September 2021.



These mAGic lessons are designed to bring agriculture to life in your classroom. They address the Illinois Learning Standards in math, science, English language arts and social studies.

Machines mAGic project update writers/reviewers: Rhodora Collins – Dekalb County; Suzi Myers – Kane County; Connie Niemann – Montgomery County; Debbie Ruff – Livingston County; Jennifer Waters – Sangamon County; and Dawn Weinberg – Hancock County.

Pay Attention to Machine Safety

By making work easier, machines are an immense help to people. Have you ever watched a package delivery person as they drop off items at your school or home? Imagine trying to move several heavy boxes without a wheeled cart. Or, have you ever observed a garbage truck lifting a full dumpster and emptying it into the truck? How would you like to empty that dumpster without the machine that picks it up and tips it into the truck? Machines of all shapes and sizes make our lives easier. Because of the sheer power of these machines, however, they can be extremely dangerous. Safety should always be your first concern when working with or near any kind of machine. Accidents can happen in an instant. An accident that causes serious injury can change the rest of your life. Some accidents can even end your life.



So how can one be safe around machines? The first rule is to PAY ATTENTION! Whether you are using a machine or simply having fun nearby, you should be constantly alert. Are you riding your bicycle towards the rear of a tractor that is backing up? STOP until you are positive the operator sees you, or quickly go another way! Maybe your neighbor has hired you to mow the lawn with a riding lawn mower. While you are operating the mower, you must pay attention to the machine and everyone near it. Carelessness (such as getting off the mower without turning off the blades) or a moment's inattention (blowing ground debris towards a passerby) could mean serious injury to you or someone nearby. Even if you are unfamiliar with how a machine operates, being alert and aware can prevent injury to yourself and others.



Paying attention is critical around machines. But it is also important to understand specific features of certain machines, whether they are found on a farm or in your own backyard. Some dangers are not very obvious if you are unfamiliar with these machines. By becoming “Machine Safety Specialists,” you will learn more about some of the special dangers of machines used on the farm and elsewhere.

Machine Specialist Cards

(to be cut out)

Dr. Adam T. Veer

ATV Safety Specialist

ATVs (All Terrain Vehicles) and UTVs (Utility Task Vehicles) are used off-road. They can operate in rough terrain where vehicles like cars or trucks cannot, making them popular as farm and work vehicles and for outdoor recreation.

ATVs are also known as 4-wheelers or quads. They are usually designed for one rider, who straddles the seat and steers using handlebars, similar to a motorcycle rider. ATVs do not have cabs or seat belts.



To avoid injury, ATV riders should:

- Always wear a DOT-approved helmet.
- Wear goggles, long pants, long sleeves, gloves, and over-the-ankle boots.
- Never ride on paved roads except to cross safely and where permitted by law.
- Never carry a passenger on a single-rider ATV.
- Ride an ATV appropriate for their age and strength.
- Ride with adult supervision if under the age of 16.

UTVs or side-by-sides can seat 2-6 people. Riders are protected by a rollbar, cage, or cab. UTV riders should always wear seat belts, operate at safe speeds, and drive on roadways only where permitted by law.

Dr. Kim Cornelius

Grain Safety Specialist

When grain crops such as corn, soybeans, wheat, and oats are harvested, they are transferred into wagons, trucks, and storage bins. Whenever grain is unloaded from a wagon, dumped from a truck, or emptied from a grain bin, it flows from a large area through a small opening. As it moves, a funnel is created by gravity. This funneling effect can pull a person into the grain and cause them to suffocate, or to die from lack of oxygen.



It only takes 2-4 seconds to become helpless in a flow of grain. In 10 seconds, a person can be completely covered! This is why you should never play around grain equipment or climb into a grain wagon, truck, or bin.

Grain suffocation can also happen in bins while the grain is being stored. A crust, or bridge, can form over the grain so that the top of the pile looks safe to walk on. But there may be an open pocket under the crust that is not filled with grain. When a person steps on the crust, they can fall through, be covered, and suffocate.

While piles, wagons, or bins of grain look like neat places to play, they can be very dangerous.

Machine Specialist Cards

(to be cut out)

Dr. Lane Trimmer

Lawn Mower Safety Specialist

Lawn mowers are used to keep lawns and farmyards trimmed and tidy. They cut grass and vegetation via powerful, rapidly spinning blades which can be extremely dangerous. String trimmers, also called weedeaters or weed whackers, present many of the same dangers as mowers.

More than 9,000 U.S. children go to the emergency room each year because of mower-related injuries. These injuries can be prevented by following these important safety guidelines:



- Children should be strong enough and mature enough before being allowed to mow.
- Mowers can throw stones, twigs, and other objects. Clear the area of such objects and make sure people are well away from the area to be mowed.
- Make sure all mower guards and shields are in place.
- Always wear closed-toe shoes or boots. Never operate a mower while wearing sandals or flip-flops.
- Always turn off the mower blades if people walk nearby or when getting off the machine.
- Never allow children to ride lawn mowers as passengers.

Dr. Ellie P. Toole

Power Tool Safety Specialist

Power tools are used to make farming and household jobs easier. Tools such as drills, circular saws, trimmers, and grinders save time and physical work. However, such tools can be dangerous to those using them and even to people nearby if used improperly.

All tools can pose some danger but electric power tools have the added danger of greater power, higher speed, and electrical currents that can shock or even kill the user.



Important safety tips for power tools include:

- Always wear personal protective gear such as earplugs for loud equipment and dust masks when creating dust by sawing, grinding, or drilling.
- Always wear safety goggles.
- Repair or replace damaged or worn tools.
- Check to be sure electrical cords are in good condition before plugging in any power tool.
- Make sure all protective shields are in place and in good condition.
- Make sure the surrounding area is dry and clear of clutter to prevent slips, trips, and falls while using power tools.

Machine Specialist Cards

(to be cut out)

Dr. Sloane M. Vickle

SMV Safety Specialist

Farm machinery like tractors and combines are driven on roads when moving from farm to field. The heavy machines move much more slowly than other vehicles. Because of this, they are required to display an SMV sign or decal on the back. SMV stands for Slow Moving Vehicle. SMV signs are designed to be highly visible, especially in the dark. An SMV sign consists of an orange triangle with reflective red bars around the outside edges.



Drivers should always be alert for SMVs, especially at dawn, dusk, and after dark. Quite often these highly reflective decals will be the only visible part of a slowly-moving machine ahead. As soon as an SMV is spotted, a driver must immediately slow down! Cars and trucks travel much faster than large, heavy vehicles like tractors. A driver may crash into the back of such a machine if they don't

slow down quickly. If a car traveling 55 mph (miles per hour) is 400 feet behind a car traveling 45 mph, the faster car will hit the slower car in 27 seconds. But if the car traveling 55 mph is following a tractor moving at 15 mph, the car will hit the tractor in just 7 seconds.

If it is necessary to pass an SMV, drivers should watch for roadside obstructions. A tractor pulling an implement may move to the center of the road to avoid signs or mailboxes. If an impatient driver tries to pass at that time, they may be hit or forced off the road.

Dr. Tracy Roller

Tractor Safety Specialist

Tractors are used to pull, push, and power other farm equipment. Planting crops, tilling fields, and moving feed are all jobs tractors are used to do. But a tractor's size and power can present dangers.

Farmers should check their surroundings before starting a tractor so that they don't accidentally hurt anyone nearby. Once a tractor is running, it is difficult or even impossible to hear someone who might need help.

Tractors can tip and roll over when they are operated on rough or hilly ground or if implements are hitched improperly. A rollover accident can injure or even kill the driver of a tractor. To help prevent this from happening, most tractors have roll over protective structures (ROPS). These sturdy bars are built over the seat and head area to protect tractor operators. Tractors with ROPS also have seat belts, which must be worn in order for ROPS to keep the driver from being hurt in a rollover.



It may look fun and seem harmless, but farmers should not allow extra riders on their tractors unless there is a "buddy seat" designed for that purpose. A rider who is not sitting in a seat and wearing a safety belt may fall and be run over by the tractor itself or the implement it is pulling. A good rule to remember for tractors is "No Seat, No Rider."

Machine Safety Information Grid

Match the Machine Safety Matching Cards with the correct descriptions on the grid below.

Usually designed for one rider who straddles the seat and steers using handlebars	Is harvested and transferred into wagons, trucks, or storage bins.	Cuts grass and vegetation with powerful, rapidly spinning blades	Used to make farming and household jobs easier by saving time and physical work.
Can be operated in rough terrain where vehicles like cars and trucks cannot	Designed to be highly visible, especially in the dark	Used to pull, push, or power other farm equipment	It only takes 2-4 seconds to become helpless in the flow of this material.
Watch for roadside obstructions before passing so as not to be hit or forced off the road.	Can throw sticks, stones, twigs, and other objects while in operation	Riders should wear a DOT-approved helmet, goggles, long pants, long sleeves, and boots.	This reflective decal may be the only visible part of a slowly-moving machine ahead.
A person can be pulled into it and suffocate, or die from lack of oxygen.	Make sure the surrounding area is dry and clear of clutter to prevent slips, trips, and falls.	Riders should only be allowed if there is a "buddy seat" designed for that purpose.	Most have roll over protective structures (ROPS), or sturdy bars built over the seat area.
Check to be sure electrical cords are in good condition before plugging in.	May tip and roll over on hilly ground or if an implement is hitched improperly.	Stands for Slow Moving Vehicle	More than 9,000 U.S. children go to the hospital each year with injuries caused by this.
String trimmers, weed eaters, or weed whackers present many of the same dangers.	Popular as farm and work vehicles and for outdoor recreation	Has the added danger of greater power, higher speed, and an electrical current	A crust may form on top making it look safe to walk on, but you may fall through and suffocate.

Machine Safety Matching Cards

(To be cut apart and matched with descriptions on the Information Grid)

ATV



ATV



ATV



ATV



grain



grain



grain



grain



lawn mower



lawn mower



lawn mower



lawn mower

power
tool



power
tool



power
tool



power
tool



SMV



SMV



SMV



SMV



tractor



tractor



tractor












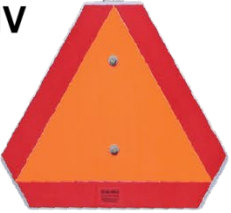
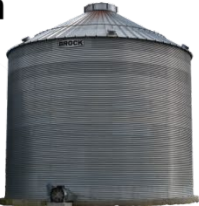













tractor



Machine Safety Answer Key






Check your answers by comparing your finished information grid to this key.

<p>ATV</p> 	<p>grain</p> 	 <p>lawn mower</p>	 <p>power tool</p>
<p>ATV</p> 	<p>SMV</p> 	<p>tractor</p> 	<p>grain</p> 
<p>SMV</p> 	 <p>lawn mower</p>	<p>ATV</p> 	<p>SMV</p> 
<p>grain</p> 	<p>power tool</p> 	<p>tractor</p> 	<p>tractor</p> 
<p>power tool</p> 	<p>tractor</p> 	<p>SMV</p> 	 <p>lawn mower</p>
 <p>lawn mower</p>	<p>ATV</p> 	<p>power tool</p> 	<p>grain</p> 

Name _____

Machine Safety I.Q.

Name at least one possible safety hazard and a related accident prevention step for each item. An example is provided for you.

	Possible Hazards	Accident Prevention Steps
ATV 	<i>Example: being struck by another vehicle</i>	<i>Example: Do not ride ATVs on roadways.</i>
grain 		
lawn mower 		
power tool 		
SMV 		
tractor 