



FARM FIELD TRIP GUIDE
A HANDS-ON CURRICULUM
FOR FARM-BASED EDUCATION

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GREEN MOUNTAIN FARM-TO-SCHOOL

Green Mountain Farm-to-School (GMFTS) is a non-profit organization in Newport, VT that strengthens local food systems by promoting positive economic and educational relationships between schools, farms, and communities. GMFTS supplies fresh, local food to schools and institutions and gives students of all ages the knowledge and skills they need to make healthy food choice through school gardens, farm-to-school programs, a regional food hub, and mobile learning kitchen. For more information, visit www.GreenMountainFarmtoSchool.org.

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LEARNING ON A FARM

The lessons a farm can teach are as bountiful as the curiosity and wonder of the children who come to visit.

Vermont, especially the Northeast Kingdom, has a picturesque beauty that is punctuated by the myriad of farms that dot the landscape. With such a rich history of farming and a strong sense of community in the area, farms can provide valuable educational opportunities for students. Through farm field trips, children gain a passion for agriculture and a better understanding of their agricultural community.

The hands-on experiential learning environment a farm provides is invaluable to the children's educational growth. The student gains a tangible education that is multifaceted and intergenerational. The lessons from a farm field trip can run the gamut from alternative energy to vegetables, maple, cows, chickens, and much more. Not only does the field trip teach children about farm practices, chores, animals, plants, the farm lifestyle, the product, and farm economics, it also can incorporate about history, math, science, art, music, and health – topics that are relevant to their classroom curriculum.

Children are the next generation of community members. Connecting schools to farms builds incredibly important relationships between the child and the farmer, the child and the land, and the farmer and the school where their products might be going. By participating in farm field trips students gain a better understanding of local agriculture, healthy eating, and their place in Vermont.

This guide was created to be a resource for teachers and farmers to support Farm-to-School programming throughout Vermont and beyond. The guide provides a collection of creative, standards-based lessons for teachers of students K-8 to integrate hands-on learning into their school curriculum before, during, and after the field trip. We have also included helpful tips to farmers and teachers, and forms to help you plan your own trip.

GROUP MANAGEMENT & SAFETY CONSIDERATIONS

RULES

The farmer and teachers should set rules ahead of time in order to ensure a safe and fun field trip. If rules are not set in place, the students could put themselves at risk or unknowingly hurt the farm. The rules should be reviewed in class and then again on the farm.

SOME RECOMMENDED STUDENT EXPECTATIONS

- Stay in the areas set by the farmer.
- No running through the farm unless you are told you can run.
- Listen to the farmer and teacher when they speak.
- Watch where you are walking!
- Be respectful.
- Have fun.

GROUP SIZE

It is a good idea to break a class into groups of 5-6 students. This is key to having a good experience. Recruit parent chaperones, other teachers or school staff, and other farm workers so that each group will be looked after by the supervising adult. Each group can be part of the whole group or each group can rotate through several activities on the farm.

SAFETY CONCERNS

Know about and prepare for any health or safety risks that might come about on the farm field trip. Things to keep in mind:

- Allergies to insects, plants, and food
- Prolonged exposure to the sun
- Wildlife
- Farm animals
- Dangerous and exposed farm equipment

You can prepare by having a fully stocked first aid kit, sunscreen, bug spray, and extra water, and by knowing allergies of the students.

TRIP TIPS FOR FARMERS

Field trips are a great way for students to apply skills they have learned in the classroom to real world situations. What better place than a farm!

The following are some suggestions to encourage the most successful trip possible.

WHY YOUR FARM?

Offering educational programs on your farm reconnects children to their heritage and opens doors to future generations of citizens who care about farming and food.

Farm field trips can help publicize your farm and encourage a next generation to buy more locally.

LOGISTICS

Lesson Plan: Use this guide and suggestions from the visiting teacher to make a plan for the trip. Try to create several stations that students can rotate through in smaller, manageable groups. Don't forget to keep an extra activity in your back pocket in case you have extra time or the weather surprises you.

Other adults: Find out how many teachers and parents will be coming with the students, and if they can help run a station.

Transportation: Schools will provide their own transportation to your farm. However, make sure there is a safe location for the students to load and unload the bus, and space for the bus to park and turn around.

Bathrooms: Students will need access to a bathroom, and to a hand washing station if they will be petting animals or eating food.

Insurance: Consult with your insurance agent to see if accidents and/or visitors are covered. Check if one-day coverage is an option if necessary. In some schools, students are covered while on field trips.

DURING THE FIELD TRIP

Take a few minutes when the students arrive to introduce yourself. Remember, students respond to your energy and enthusiasm as a presenter.

Define areas that are off-limits to students and staff before activities begin.

Designing a scavenger hunt is a unique and engaging way to introduce your farm. It also sets the tone for fun, interactive learning for the day.

The teachers and chaperones are there to support you during the field trip; do not hesitate to ask for assistance whenever necessary.

Using specific examples when presenting important aspects of the farm operations will allow students to gain a better understanding of the functioning of the farm. For example, instead of saying, "This is an important piece of equipment," explain that "Without this piece of equipment I wouldn't be able to do a), b), and c)."

With a large group it can be helpful to rotate students through various stations.

Asking for student volunteers in demonstrations and designing hands-on activities will help make the trip fun and engaging.

Consider setting aside time at the end for a brief discussion and additional questions. Use this time to share what you and the students enjoyed about the day.

Please take a few moments to fill out the post-trip survey so that you and the school can continue to provide meaningful field trip experiences for students, teachers, and farmers.

TRIP TIPS FOR TEACHERS

Field Trips are a great way to introduce concepts and practice skills in connection to realworld applications.

Here are some suggestions to help make your trip the most successful it can be!

BEFORE THE TRIP

Before deciding what farm to visit, it's good to know what you are looking for:

- How far are you willing to travel?
- Is there anything in particular you want the children to see?
- How will you integrate the farm trip into your classroom studies?
- Will you take snack or lunch? Will the farm provide a snack?
- Contact the farmer about possible activities and give them a few days to choose from. Inform the farmer of any special needs your students may have, such as allergies or physical challenges.
- Use this guide to plan any activities. Gather and create any materials you may need.
- Send out permission slips, ask for chaperones, and schedule transportation.
- Introduce the farm trip to the students with a pre-activity included in the lesson plan or by brainstorming a list of questions to ask the farmer.

DAY OF THE FARM TRIP

- Make name tags for everyone so that farmers can address students individually.
- Students should bring proper shoes, a jacket or raincoat, a bottle of water, and a snack/lunch if needed. Whatever they bring with them, they must take back with them, including any trash.

Divide the students into groups with chaperones in each group. Each adult should watch over 5-6 students.

- Go over rules and expectations with the students. See [Group Management and Safety Considerations](#) for expectation examples.
- Encourage farm and food related discussions on the way to the farm.
- Remember, it is not the role of the farmer to keep track of students and to manage their behavior. Please help to keep the students together in their assigned groups and ensure that they behave in a respectful manner.

WRAP-UP

- Consider writing a thank you letter to the farm as a group or as individuals. This small gesture is a meaningful way to thank the farmer for hosting the farm field trip.
- Please take a few moments to fill out the post-trip survey so that you can continue to provide meaningful field trip experiences for students, teachers, and farmers.
- Conclude the lesson by using a post-trip activity to highlight the lesson you wanted them to learn.

MATERIALS:

Beekeeper outfit and props
Role Play Props: crown, feather dusters, first aid kits, plastic cups, nectar and pollen, packing peanuts, etc.
Play flowers
Tools: old and new
Two blankets
Honeycomb
Honey variety sampler
Popsicle stick tasters
Things to make candles: wax, crock pot, wicks

There is a wide array of farms that incorporate animals into everyday operations. Bees are often kept on farms to help pollinate fruit and vegetable plants. Farmers can also harvest honey.

ESSENTIAL QUESTION:

How do bees make honey?

OBJECTIVES:

1. Students will understand how bees find and gather nectar.
2. Students will explore the tools a farm uses to care for bees and how they have changed over time.
3. Students will learn about products made from honey or beeswax.

PRE-TRIP ACTIVITIES:

- Read about bees and pollination
- Talk about beekeepers and their job

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Bee Role Play
- Hidden Tools
- Bee Dance
- Be a Beekeeper
- Honey variety taste test
- Filler: Make a Beeswax Candle
- Filler: Bee Freeze Tag
- Wrap Up

POST-TRIP ACTIVITIES:

- Build a honeycomb or hive in the classroom
- Read Honey Cookies by Meredith Hooper and make the recipe
- Write a story about being a bee

APIARY

MEET THE FARMER *10 minutes*

Greeting: Have the students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students what they will be doing today.

BEE ROLE PLAY *30 minutes*

Students each take on the role of a bee in a hive. They learn about their role and then act out the beehive as a group.

1. Introduce students to a beehive. Ask them to watch the bees and try to figure out what they are doing. Tell them they are going to pretend that they are a beehive and each student will play a role.
2. Split your students up into groups representing the three different types of honeybees inside the hive: queen, drones, and workers (broken into queen's attendants, nurse bees, housekeepers, wax makers, guard bees, and field bees). Set up boundaries for the role play area.
3. The queen sits in a chair at the front, the drones sit on the ground to one side, and the workers are dispersed throughout the hive. (Remind your students that, in order for a hive to survive, all of the honeybees must do their part).
4. Give the students simple props relating to their parts. (For example, give the housekeepers feather dusters and the wax bees small cups to be arranged into honeycomb.)
5. Spread pollen and nectar (packing peanuts) throughout the area for the field bees to collect and bring back to the hive. Field bees can only carry two pieces of pollen and nectar at a time. The field bees must enter and exit through a designated entrance supervised by guard bees.

6. Allow the students a few minutes to role play the hive. The wax bees can "build" honeycomb by setting the cups in neat rows.
7. The queen's attendants should bring the queen food every 30 seconds.
8. The guard bees keep the field bees moving in and out of the hive in an orderly fashion.
9. The field bees make several collection trips to bring nectar and pollen back to the hive and place in the honeycomb.
10. The nurse bees can take pollen from the food stores.
11. After the role play, the students will observe a beehive on the farm and try to identify the different types of bees.

Reflect: Do you think that the hive works well together? What are some challenges to being so dependent upon one another? What are the benefits?

HIDDEN TOOLS *15 minutes*

Students will be introduced to the tools a beekeeper uses to keep a hive healthy and to collect honey.

1. Have two blankets. Place one on the ground while the students are doing another activity. Place old and new beekeeping tools on the blanket. Place the second blanket over the first to cover all of the tools.
2. Have the children stand in a circle around the blanket. Tell them you are going to lift the blanket up and they will have 1 minute to remember as many tools as they can.
3. Lift the blanket up and after 1 minute, put the blanket back down.
4. Ask the students to describe what they saw. When they have all shared, lift the blanket and point out any of the missed items.

5. Go through each of the tools, what they are used for, and if they are modern or not. As they continue on their field trip, ask them to keep an eye out for the tools they see.

Some tool ideas:

- Beekeeper outfit: gloves, veil, overalls, white clothes
- Beekeeping tools: hive tool, boxes, supers, frames, spinner, decapper
- Honey comb: frame with honey comb in it or a jar with the comb
- Honey made products: lip balm, candles, cough drops

Reflect: After seeing all of the tools and equipment a beekeeper uses to stay safe, would you be a beekeeper?

BE A BEEKEEPER *15 minutes*

Students learn about beekeeping and try doing some of the tasks.

Beekeeper dress up

- Students try on the clothing worn while working with bees. Students can try on the gloves, veil, and white overalls. Why do you think it is a good idea to wear white? How should you move around the bees?

Beekeeping tools

- Students are introduced to some of the tools used by beekeepers. This can include the hive tool, boxes, supers, frames, spinner, and decapper.

The honeycomb

- Students explore a super with honey still in the comb. The beekeeper can pick up a frame and have students decap the comb for spinning.

Spinning honeycombs

- Students rotate between spinning the centrifuge and using their senses to observe a piece of honey comb.

APIARY

BEE DANCE *20 minutes for activity*

Students learn how bees communicate with one another about where to find flowers with nectar. They are split into two groups. One group goes and finds some nectar and then has to do a dance that relays where the nectar is. The second group must follow those instructions to find the nectar.

1. Educator introduces the activity:
 - a. Ask students, "If you were a bee how would you communicate with others?"
 - b. One bee that was not part of the role play was the Scout Bee. Scout bees search long and hard for flowers with lots of pollen. They then tell worker field bees where the best source of pollen is so they can make honey out of the pollen. Scout bees use their bodies to point the direction of the flower and wiggle to display the distance to the flower. If a flower is close they wiggle more. If the flower is far they wiggle less.
2. The teacher will demonstrate the wiggle and direction, point, and then have students practice the wiggle. Have the students do a practice run as a whole group with the teacher as the scout bee.
3. Students are divided into pairs. One is the scout bee and the other is the worker field bee. They will communicate with each other using the following honey bee wiggle dance. Once all scout bees have hidden flowers and all worker field bees have found them, have student switch roles.
 - a. Scout bees:
 - Each scout bee hides a flower away from the others then gives directions to worker bees.
 - Direction: walk a short straight line toward the flower while flapping wings and loop around.
 - Distance: Add a wiggle to show how far it is.
 - b. Field bees:
 - Pay close attention to the scout bee's dance.
 - Try to find the flowers without talking!

DISTANCE KEY

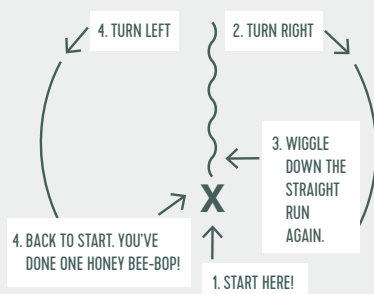
If flowers are ...

VERY FAR AWAY – 25 feet or more : Dance 1 Scout Bee wiggles VERY slowly

FAR AWAY – 15-25 feet : Dance 2 Scout Bee wiggles slowly

CLOSE – 10-15 feet : Dance 3 Scout Bee wiggles quickly

VERY CLOSE – less than 10 feet : Dance 4 Scout Bee wiggles VERY quickly



HONEY VARIETY TASTE TEST *15 minutes for activity*

Students taste different kinds of honey: clover, wildflower, buckwheat to see the differences in color, taste, texture.

1. Talk with the farmer ahead of time and find out what kinds of honey, if any, the students can taste on their farm. If necessary, purchase other kinds of honey to bring on the field trip.
2. Have students take turns tasting the varieties of honey. Have them use descriptive words and comment on their favorites.

Filler:

CANDLEMAKING

Students will make beeswax candles by dipping a string into a crock pot with beeswax inside. Have students form a line and take turns dipping their string in once and going to the back of the line. (Find an old crock pot or a used one at a thrift store. Once it is used for wax candles, you won't be able to easily use it for food use again.)

Filler:

BEE FREEZE TAG

Students will play freeze tag. Students are bees and "it" is one student that represents cold weather that "freezes" or slows down the buzzing bees.

WRAP UP

Reflect:

- What are some things you did today?
- What are some things you learned today?
- We had an amazing time here!

Let's thank the farmer.

MATERIALS:

Baskets to harvest in*

Scale*

Wooden Spoons

Apples to drop

Knife

Cutting board

Book: *Apple Farmer Annie*

**should be available at farm*

Apples grow all over Vermont, some on the side of roads, some in people's yards, and some on farms called orchards. On orchards, they grow some of people's favorite apples as well as some lesser known varieties.

ESSENTIAL QUESTION:

What does an apple orchard look like?

OBJECTIVES:

1. Students will be able to name several key items located on an apple orchard.
2. Students will help harvest and weigh apples.

PRE-TRIP ACTIVITIES:

- What is an apple farm?
- What are parts of an apple tree?
- Taste Test several varieties of apples from a store, ask students what qualities they like, chart results.

FIELD TRIP ACTIVITIES:

- Tour the Apple Farm
- Pick Apples
- Apple Measurements
- Taste Test Varieties
- Filler: Apple Races
- Filler: Apple Songs
- Filler: **Book:** *Apple Farmer Annie*
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Cook a recipe with apples
- Dissect an apple and name the parts

APPLES

MEET THE FARMER 10 minutes

Greeting: Have the students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students what they will be doing today.

TOUR OF THE APPLE FARM 20 minutes

The farmer will lead a tour of the orchard. This can be a whole group tour or one station if the class is split into groups. Some farms may be able to take the kids on a hayride around the orchard.

1. During a tour of the orchard, point out some key features or interesting facts at the orchard, such as:
 - a. The best conditions for growing apples
 - b. Bee hives
 - c. Barns
 - d. Apple picking machines
 - e. Cider press
 - f. Different ages or stages in development of apple trees.

Reflect: Did you see anything you didn't expect to see on an apple farm?

PICK APPLES 20 minutes

If there is time let the students pick some apples at the orchard.

1. Why would we want to pick apples? What can we do with apples we pick? We can eat them whole, make apple pies, or make applesauce.
2. Have students stand with you by an apple tree. Discuss how to pick an apple without hurting the apple tree.
3. Give any tools or baskets to groups of 2-5 students. Each group should pick from just one or two trees at a time, and can move together to another part of the orchard after a few minutes.

4. When groups are done picking apples, they should bring the apples to the main part of the orchard to weigh them.

Reflect: What would make apple picking easier?

APPLE MEASUREMENTS 15 minutes

Using apples that students have picked, students will guesstimate and weigh bushels of apples. If students do not pick apples, they can use bushels or bags already full of apples.

1. How does the orchard determine how much to charge for the apples? Do they charge by the apple? By the basket? By how much they weigh?
2. If they charged by bushels, how many bushels did we pick?
 - a. First, GUESS how many bushels your class picked?
 - b. Now, COUNT how many bushels there are.
 - c. Were you right? How close were you?
3. If they charged by apple, how much would one of your baskets cost?
 - a. First, GUESS how many apples are in this basket?
 - b. Now, COUNT how many apples are in your basket.
 - c. Were you right? How close were you?
4. If they charged by weight, we need to figure out how much our apple baskets weigh.
 - a. First, GUESS how much your bushel of apples weigh. (To help, you can weigh one apple as a hint for the students. You could also weigh another bushel that the students can pick up and feel. They can compare that weight to their own bushel.)
 - b. Now, let's WEIGH your apples.
 - c. Were you right? How close were you?

Reflect: Can you think of something else that is the same weight as your apples?

APPLE TASTE TEST 20 minutes

Students will get to taste five different varieties of apples and compare their different appearances and tastes.

1. Explain to the students that a single food, like apples, can have many different varieties. Different varieties, or types, can taste slightly different and be used for different things. Carrots, for example, can be orange like we are used to their being, or they can be yellow or red or purple. They all have different qualities and tastes; some are great to store for the winter and others are really sweet.
2. What might we look for in apples that we would buy? (color, size, taste – eating, cooking, sauce, storage, pest-free)
3. As you introduce each apple and prepare it for the taste test, ask students to observe the color and appearance, and to guess what it will taste like. Encourage them to use descriptive words.
4. Place apple slices on individual plates or napkins. Students should carefully observe the flavors and textures of each apple that they taste!
5. After they all taste one apple, ask them to describe its taste. Try to get them to include the thickness and taste of the skin. Have them use all of their senses! Encourage them to come up with descriptive words that they would not normally use: crisp, fresh, tangy, tart, etc. Each apple should have a different word since they all don't taste the same.
6. Continue to do taste tests for the remaining apple varieties.

Reflect: Compare and discuss the different types of apples. Take a survey of which apples tasted the best by asking students to raise their hands.

APPLES

FILLER:

APPLE RACE

Students can have fun doing a relay race with an apple on a spoon if there is extra time.

1. Divide the students up into groups (as many groups as you have wooden spoons).
2. Define a starting line and turnaround line.
3. With an apple on a wooden spoon, each student must walk carefully to the turn-around point and return to the start line with the apple on the spoon. The student trades off the apple to the next student in line.
4. If the apple drops, the student must go back to the starting point.
5. See who can go fastest!

FILLER:

APPLE SONGS

Students will sing songs about apples. These can be done at the end of the trip, while on a hayride or walking around, or on the bus ride to or from the orchard.

1. **Apple Song:** (*Tune: Itsy Bitsy Spider*)
(use hand movements)

Once a little apple seed was planted in the ground.

Down came the soft rain, falling all around.

Out came the big sun as bright as bright could be,

And that little apple seed grew up to be an apple tree!

2. "1 Little, 2 Little, 3 Little Apples"
(*Tune: 1 Little, 2 Little, 3 Little Indians*)

1 little, 2 little, 3 little apples,

4 little, 5 little, 6 little apples,

7 little, 8 little, 9 little apples,
on my apple tree.

Munch little, munch little,
munch little apples.

Crunch little, crunch little,
crunch little apples.

Bunch of little, bunch of little,
bunch of little apples,

Good for you and me!

3. Ten Red Apples

Here I have five apples.
(hold up five fingers)

And here are five again.
(hold up other hands)

How many apples altogether? (shrug)

Why, five and five make ten! (clap)

FILLER:

BOOK: *Apple Farmer Annie*
by Monica Wellington

Annie is an apple farmer. In this book kids follow her through planting, caring for, harvesting, and creating value added products with apples!

Listening question: What are some of the things that Annie does with her apples? Why did she sort them? What would you look for in an apple to make pie? Apple-sauce? Cider? Store all winter?

Reflect: Did you know that growing apples could be so much fun? Why is growing apples important? Without apples what would we be missing out on?

WRAP UP

Reflect:

- What is something you did here?
- What is something you learned?
- We had an amazing time

MATERIALS:

Blueberry Connection
images or real items

Cookbooks that use
blueberries

Book: *Blueberries for Sal*
by Robert McCloskey

Paint samples

Blueberries are a common crop grown in New England. Farmers have to pay attention to the soil and to each individual plant in order to have a successful crop.

ESSENTIAL QUESTION:

What are farmers responsible for when growing successful blueberry crop?

OBJECTIVES:

1. Students will learn what a farmer needs to do to care for blueberries.
2. Students will participate in a farm chore that helps the blueberries grow.
3. Students will make a plan to use a successful blueberry harvest.

PRE-TRIP ACTIVITIES:

- What does a blueberry plant look like?
- What can you make out of blueberries?

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Blueberry Connection
- Chore
- Harvest Blueberries
- Plan for Blueberries
- Filler: Book: *Blueberries for Sal*
- Filler: Paint Sample Nature Match
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Journal entry about the trip
- Cook with blueberries, taste test different recipes
- Freeze for Food Service Directors

BLUEBERRIES

MEET THE FARMER *10 minutes*

Greeting: Have students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students what they will be doing today. For example, "we will be helping the farmer with a garden chore and then picking blueberries. When you get back to the school today or tomorrow we will preserve them or cook them!"

BLUEBERRY CONNECTION *15 minutes*

Students will be introduced to a variety of objects that are connected in some way to blueberries. This activity will start a conversation about all of the things that go into growing, harvesting, and using blueberries.

1. Standing in a circle, pass around the following items:

- Image of bee or other pollinator
- Image of sun
- Pruning shears
- Bag of soil
- Bag of woodchips
- Cardboard pint box
- Image of bird
- Image of hail storm
- Reflective tape
- Freezer bag
- Pie pan
- The word "patience"
- Clock to represent time
- Netting

2. Instruct the students to look at each item as it is passed around the circle. Think about what it might have to do with growing blueberries. Remind them that different tasks must be done throughout the year in order to have a successful blueberry crop.

3. Once all the items/images have been passed around, lay them in the center of the circle and ask students which items/images they think are most important this time of year. Give them clues or ask the farmer to share their experiences.
4. Ask a few students to share one thing they know about blueberries, or their favorite way to eat blueberries. Invite any questions students might have about blueberries and their cultivation.

Reflect: How easy or difficult do you think it would be to grow your own blueberries?

CHORE *20 minutes*

Ask the farmer ahead of time what kind of chore needs to be done, if any. Possibilities could be mulching, pruning, planting, etc. This is a good time for the students to get their hands dirty and participate in farming.

Remind students that we will be picking berries after we work, so don't pick any yet! (If this doesn't seem possible with your group of students, it might be good to give permission for everyone to eat just one handful of berries to energize themselves before getting to work.)

Reflect: What did you find surprising about the chore? Was it difficult or fun?

HARVESTING BLUEBERRIES *30 minutes*

Students will harvest blueberries that will be used at their school.

1. Have students gather around and give your expectations of blueberry harvesting:
 - a. Explain how you can tell when a berry is ripe. Encourage students to taste berries of different degrees of ripeness so they can see why it's important to pick only the berries that are completely blue.

- b. Ask how other people have picked berries before. Demonstrate appropriate berry-picking techniques, explain the importance of picking each bush thoroughly, and give instructions on where to get empty boxes and place full boxes.

- c. Remind students that doing a good job is more important than picking quickly.

- d. Ask students what they think the rules should be about how many berries you can eat. While you're picking, encourage accountability so that kids expect each other to come back to the group with plenty of berries that have been saved and not eaten.

- e. Go over a signal so the students know when it is time to gather back together.

2. Give the students empty containers and have them work in small groups in a designated area.

3. After the appropriate amount of time, use your signal to get everyone to return.

Reflect: How did harvesting go? Look at how many berries we all picked!

PLAN FOR BLUEBERRIES *15 minutes*

After their amazing harvest, have the students brainstorm ideas of what they would like to make with their blueberries.

1. Count how many pints or quarts were harvested. Estimate how many berries may have been harvested total. If time allows, work on calculating the average speed at which students picked (how many berries/minute). If there is a second trip to the berry bushes, it could be neat to use this as a comparison to see how efficiency improves as students become more experienced berry-pickers.

BLUEBERRIES

2. Divide the students into groups of five. Have each group come up with ideas for what they like to do with their blueberries. Provide cookbooks and canning/preservation books for each group to use.
3. Bring the groups back together and have one person from each group share what they would like to make.

Reflect: What are some of your favorite blueberry dishes? What are some new dishes you would now like to try?

FILLER:

BOOK: *Blueberries for Sal*
by Robert McCloskey.

Little Sal and her mother go to Blueberry hill to pick berries, and they plan to can them as preserves for the winter. Little Sal soon starts eating all the berries she picks, plus some from her mother's pail. Encouraged to go off to find berries to pick by herself, mother and Sal become separated. On the other side of the mountain, Little Bear and his mother are coming to eat all the blueberries they can to get as fat as possible so they can survive the winter. They, too, get separated.

Reflect: Discuss whether or not we should let wild animals snack on some of the food we are intending to grow for people. Ask: How is the families' experience in the book the same and different from your experience?

FILLER:

PAINT SAMPLE NATURE MATCH

Using paint samples, students will try to find the same color in the environment around them.

1. Have the students divide into pairs.
2. Explain that each pair will get two paint sample colors. Some may seem easy to find and some may seem difficult, but nature is full of many colors if we look closely.
3. Ask them to go with their partner in a designated area or on a group walk and look for those colors.
4. When they find the two colors in nature, they can come back to the teacher to get another two colors.
5. When time is up or the walk is completed, have them gather together and share anything surprising they found.

Reflect: Was it easy or hard to find the colors I gave you?

WRAP UP

Reflect:

- What is something you did today?
- What did you learn here?
- We had an amazing time here at the blueberry patch! Let's thank the farmer.

MATERIALS:

Blank Paper

Markers and crayons

Items from a tree: cones,
needles, bark pieces,
buds, twigs

Cross-section of a tree

Lined paper

Pencils

Clipboards

Handkerchief or bandana

There are many important aspects of agriculture that don't involve the direct production of food. There are some interesting ways Vermonters are using land to redefine agriculture in the Northeast Kingdom.

ESSENTIAL QUESTION:

What is a Christmas tree?

OBJECTIVES:

1. Students will learn how to identify different types of Christmas trees and determine the age of the tree.
2. Students will decide best land management practices for a Christmas tree farm.
3. Students will be able to name the internal parts of a tree.

PRE-TRIP ACTIVITIES:

- Research the cultural importance of Christmas trees throughout the world
- Learn about the history of Christmas trees

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Farm Tour
- Are You Barking Up the Right Tree?
- Be A Tree
- Land Management
- Farm Chore
- Filler: People Key
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Write a story about the life of a Christmas tree from seed to Christmas Day

CHRISTMAS TREES

MEET THE FARMER *10 minutes*

Greeting: Have students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students what they will be doing today. For example, "we will be touring the farm, identifying different types and parts of Christmas Trees, deciding land management and care practices, and helping the farmer with a chore."

FARM TOUR *30 minutes*

Students will get a tour of the Christmas Tree farm.

1. Have the farmer give a tour of the farm and facilities.
2. A few great places to point out: sections of different tree types, tool shed, watering facilities, significant land characteristics.
3. Throughout the tour, the teacher should make sure to note the different tree types and their names to be used throughout the field trip. If the trees are not labeled, the teacher can create labels or name tags using papers and markers.

Reflect: Can you estimate how many Christmas Trees are on this farm?

ARE YOU BARKING UP THE RIGHT TREE?

40 – 50 minutes

After touring the farm and seeing the variety of trees, students will learn how to identify Christmas Tree types using different parts of the tree. This activity works best using real parts of the tree gathered from the farm.

1. Group students in pairs or small groups of three.
2. Discuss with the students that there are different types (maple, oak, aspen, spruce, etc). Within those types, there are different varieties (sugar maple, quaking aspen, blue spruce, etc). While different trees might be of the same type, each variety has different characteristics. These different characteristics help us to identify which "type" that tree may be. Students will be examining these characteristics to identify trees.
3. Using items from the trees, have the groups or pairs work together to identify the "type" of tree the item belongs to.
 - a. Needles
 - b. Cones
 - c. Buds
 - d. Twigs
4. Once students have used the items to identify trees, explain to them that they will try to identify trees using bark rubbings.

5. Demonstrate how a rubbing can be made by placing paper over an item and rubbing the side of a crayon over the paper to create the image.
6. Give each group or pair a few pieces of paper. Tell them they will create their own bark rubbings in a certain area of the farm. As they take their rubbings from various trees, encourage them to notice where and how each tree is growing. What else is growing around the tree? Was it planted or is it growing naturally? Tell students to meet back at a designated location before they disperse.
7. Once all the students have returned, have them exchange rubbings with another group or pair. When the exchange is finished, encourage students to describe the textures they see. Ask: What will the bark look and feel like? Do you see any distinct patterns?
8. After the observations have been made, allow the students to try to identify the trees by comparing the tree bark to the rubbings.
9. Groups and pairs can exchange rubbings until everyone has identified a different tree using different rubbings.

Reflect: Besides trees, what other living things have types and varieties?

CHRISTMAS TREES

LAND MANAGEMENT *30 minutes*

This activity will encourage students to think about the impacts tree farming may have on people and the environment.

This is predominantly a discussion-based activity.

1. Have the students work in small groups to create a list of observations of the farm. This list could include:
 - a. Tree sizes
 - b. Planting patterns
 - c. Varieties
 - d. Shapes
 - e. Water source (How are the trees watered? Is there a stream?)
 - f. Slope of the land
 - g. Other vegetation or plant growth
 - h. Potential habitat locations
 - i. Wildlife
2. Using the list of observations they have created, have students create two lists: one about the pros of Christmas Tree Farms, and one about the cons of Christmas Tree Farms. Discuss the lists they have created. Make a note of the principal concerns.
3. Next, have the students decide how they would plan their farm. Have them draw their farm on the backside of their pro/con list. Questions to consider while planning their farm:
 - a. Where would your farm be located?
 - b. How much property/acreage would your farm have? What does the property look like? Do you have to remove other vegetation from your farm?
 - c. Where is your water source?
 - d. Will you use chemical fertilizers? Pesticides? Other sprays?
 - e. Does the land slope? If so, where is the slope focusing?
 - f. How will you plant your farm? What types of trees will you plant?
 - g. When will you harvest? What will happen to the stumps?

4. Working with the farmer, have the students ask questions based upon the lists and the farm they created. How did the farmer create their farm? What were their concerns?

Reflect: What sort of practices do you think tree farmers should or should not follow?

CHORE *20 minutes*

Ask the farmer ahead of time what kind of chore needs to be done, if any. Possibilities could be mulching, pruning, planting, etc. This is a good time for the students to get their hands dirty and participate in farming.

Reflect: What chore do you think requires the most time?

FILLER:

PEOPLE KEY

This is a great activity that encourages students to pay close attention to identification.

1. Explain to the class that you will be the scientist and they will be your specimens. Secretly choose one characteristic that will divide the class into two groups.
2. Explain to the students that you will be asking them to stand together in two groups based on this secret characteristic. Ask them to look closely at the members of each group to determine the characteristic. Stress that they not mention what trait they think you used.
3. Continue to sort the students into smaller and smaller groups.
4. Have the students guess what characteristics each small group represents.

Reflect: How can we break the groups up even more?

WRAP UP

Reflect:

- Can you tell me three things you learned today?
- We had a great time here at the Christmas Tree Farm!

MATERIALS:

Graph paper
Clipboards
Pencils
Toothpicks
Graph paper
Areal photos of previous
corn mazes
Photo of actual maze

Anyone who has ever planted a garden in the Northeast Kingdom knows our climate creates a challenging and brief growing season in which to grow fruits and vegetables. As a result, farmers have come up with some unique ways of diversifying their farms throughout the year.

ESSENTIAL QUESTION:

How do you make a corn maze?

OBJECTIVES:

1. Students will analyze, three dimensionally, the corn maze as they experience it.
2. Students will solve the maze in teams.
3. Students will create a map of the maze as they solve it.

PRE-TRIP ACTIVITIES:

- Research different types of corn and their history
- What is a maze? Make a maze for a friend to solve.
- Research projects – Study three dimensional shapes

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- 3D Maze
- Maize Time
- Celebrate & Share
- Filler: Pop-Pop-Corn
- Filler: Mini 3D Maze Building

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Build a 3D maze at school
- Cook with corn

CORN MAZE

MEET THE FARMER *10 minutes*

Greeting: Have the students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students the plan for the day – they will be thinking about 3D designs and geometric shapes as they go through and solve the corn maze.

3D MAZE *10 minutes for activity*

Students will view and interpret aerial photos of previous corn mazes. Show the students aerial photos of corn mazes. Most corn mazes have them from the previous years. Pass them around to the students.

- a. What does it take to turn a 2D maze into a 3D maze? (depth of walls, height of walls, size of paths, planting vs harvesting the design)
- b. How did people design these mazes?
- c. What designs would you use?
- d. What shapes, lines, curves, or other features do you see in these photos?

Reflect: What features do you think you will find in this corn maze?

3D MAZE *60 minutes*

Students will break into groups with an adult in each group. As they go through the maze, they will map their progress onto graph paper.

1. Break the students into groups. It may help to have predetermined groups with an adult leader in each one.
2. Have students sit down or stand in an area away from the distraction of the corn maze so they can pay attention.
 - a. Go over any rules of the maze and expectations of their behavior.

- b. Describe a location for everyone to meet after they have completed the maze.
- c. Explain that while they go through the maze, they will work with their team to create a map of the maze! Give each group a few pieces of graph paper, a clip board, and a few pencils.

*Creating a map of the corn maze as they go may be challenging and tedious after a period of time. If needed, give the groups a time limit such as "Make your corn maze map for 10-20 minutes, and then just try to solve the maze without a map."

3. Complete the maze!

CELEBRATE & SHARE *15 minutes*

After students have completed the maze, gather everyone together to discuss their experiences, maps, and observations.

1. Have students gather together in a large circle. Ask:
 - a. On a scale of 1-10, 10 being extremely difficult, how hard was it to complete the maze?
 - b. Discuss:
 - a. How did the maze trick you?
 - b. What didn't work?
 - c. What shapes did you find?
 - d. What features in the maze helped you complete it?
 - e. What special things did you find in the maze?
 - f. How hard was it to make your map? Share them with each other.
 - g. Vote on the most accurate map
2. Compare the "most accurate" map to the actual map/aerial photo.

FILLER:

MINI 3D MAZE BUILDING

Students can practice creating a 3D maze like the one they just went through by using toothpicks and the ground. Toothpicks can be laid down to make an outline or they could be stuck in the ground vertically to stand up. They can work together to make one large one or work independently to make smaller individual ones.

FILLER:

POP-POP-CORN

This silly game of Pop-Pop-Corn (like Duck, Duck, Goose) will help get energy out in a fun, organized way.

WRAP UP

Reflect:

- What is something you learned today?
- We had an amazing time here! Let's thank the farmer.

MATERIALS:

Rocks to Cheese images
or real items

Dress Up a Cow
costume items

Which One is Moo? Images,
plastic items, or real items

Book:

Milk: From Cow to Carton
by Alik

Handkerchief or bandana

Blanket

Vermont has a wide array of farms that incorporates animals into everyday operations. Being able to see animals firsthand gives students the opportunity to use their senses to investigate the types of care and thoughts needed to raise cows for food and fuel on a working farm.

ESSENTIAL QUESTION:

What is a dairy farm and why are they important to us?

OBJECTIVES:

1. Students will learn where milk and dairy products come from.
2. Students will learn how to care for a cow; about responsibilities on a dairy farm; and how to milk a cow.
3. Students will identify products that are made from cows.

PRE-TRIP ACTIVITIES:

- Research a dairy farm
- Read a book about dairy
- Explore the life stages of a cow

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Tour the farm and milking demonstration
- From Rocks to Cheese
- Dress Up a Cow
- Which One is Moo?
- Filler: **Book:** *Milk: From Cow to Carton* by Alik
- Filler: Game: Cow Chases Tail Game
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Journal entry about the trip
- Make butter

DAIRY

MEET THE FARMER *10 minutes*

Greeting: Have students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students what they will be doing today. For example, "we will be touring the farm, helping the farmer with a milking chore, and exploring cow products."

TOUR OF FARM AND MILKING DEMONSTRATION *60 minutes*

Kids get a tour of the cows' living space, food source, the milking stalls, and milking room.

1. Have the farmer give a tour of the farm and facilities.
2. A few great places to see: pasture, calving pen, cow barn, grain/hay storage, and the milk storage.
3. After the tour is completed, bring students to the milking parlor for the milking demonstration.
4. Instruct students that cows drop their milk when they are calm, so everyone needs to be quiet and calm as well.
5. Introduce students to the milking process. Information to include would be how much milk a cow can produce and how many cows are milked per day.
6. Use your hands to show the students what milking by hand looks like. Use one hand as the udder which gets milked by the other hand. Have all students practice on their own hands.

7. The farmer will give a short demonstration of milking a cow by hand or by machine.

8. When he is finished, a few students can try their hand at milking, closely helped by the farmer.

9. If applicable at the farm, allow students to compare the two milking methods: hand versus machine. The farmer could explain the pros and cons of each system to the students.

Reflect: How easy do you think it is to milk a cow?

DRESS UP A COW *15 minutes*

Students learn about the different parts of a dairy cow by dressing up as a cow.

Materials needed: black felt circles (spots), pink felt (stomach), 2 socks (hooves), headband with cardboard or felt ears, bottom of a milk jug with four baby bottle tops glued on (udder), sandpaper strip glued to pink felt (tongue), and a large bag to store items in

1. Ask the students to imagine what the animals look like. What makes them unique?
2. Pick a volunteer from the class or the teacher and have them stand by you, so everyone can see them. (Whisper in your volunteer's ear to ask permission to dress them up.) Explain to the class that they are going to help you turn their volunteer into a cow. Maintain a no touching/harassing the cow volunteer rule to respect privacy.
3. Ask the students for suggestions on how to make your volunteer look more like a cow.

4. As they come up with ideas, dress up the volunteer with the props you have in your large bag:

- a. Spots – Holstein cows are a breed of dairy cow that have black spots on their hides. Loose skin helps to protect the cow from insect bites.
- b. Stomachs – A cow has one stomach with four compartments to help with the digestion of food.
- c. Tongue – Helps to pull in the grass and hay that the cow eats.
- d. Hooves – Hooves help to loosen up the soil so new grass can grow more easily. Each hoof is technically a covering of horn, protecting two toes – very similar to a nail or claw found on other animals.
- e. Ears/Horns – Ears help to transfer heat. Some cows with larger ears can fan themselves in warm weather.
- f. Tail – Used to swat flies away.
- g. Udder – A large bag-shaped organ on female cows that produces milk after a cow has had her first calf.
- h. Eyes – Cows' large eyes are on the side, to be aware of what is going on all around them including predators or danger.

5. After the volunteer is dressed up with all the props, ask the students what they could add to make the student look even more like the animal (covering, placement of features, lack of features, posture, habitat, etc.).

Reflect: How are you different from a dairy cow?

DAIRY

WHICH ONE IS MOO? 20 minutes

Students will learn to identify products made from cows and products that do not come from cows. Use plastic items, real items, or images!

1. Put the students in two equal groups. Arrange them in two lines. Put a bag in front of the two lines of students. About 10 feet away from the students, put two buckets side by side. On one bucket, place a photo of a cow to represent a cow product. On the other, place a photo of a cow with a line through it, to represent not a cow product.
2. On a bag in front of the students, place the following cow and non-cow items:
 - a. Hamburger
 - b. Football
 - c. Pencil
 - d. Milk bottle
 - e. A book
 - f. Yogurt carton
 - g. Headphones
 - h. Ice cream carton
 - i. Sunglasses
 - j. Cheese
 - k. Shoes
 - l. Hot dog
 - m. Roast beef
 - n. Steak
 - o. Butter
 - p. Leather purse
5. Instruct students that the first person in line will pull out one item from the bag. They will run to the other side and, if the item comes from a cow, they will place it in the bucket with the cow photo. If it does not come from a cow, it will go into the bucket that has the picture of the cow with the line through it. After they put the item in the bucket, they will run back to their team's line and give the next person in line a high-5. The next person can then take his or her turn picking an item and placing it to a bucket.

6. The game is over when all of the items have been placed in a bucket.
7. When they are finished, have them sit down in a circle. Grab each bucket and go through the items one by one to check if it was placed in the correct bucket. When going through the cow product buckets, ask if they know what part of the cow gave us that product.

Reflect: What items tricked you? What other things do you think come from cows?

FILLER:

BOOK: *Milk: From Cow to Carton* by Aliki

Aliki takes readers on a guided tour that begins with grazing cows, proceeds through milking and a trip to the dairy, and ends with some different foods made from milk. This book gives a funfilled and informative explanation of milk's trip from green grass, to cow, to a cool glass on the table.

Listening Question: What do farmers need to do to take care of a cow? What are the steps to get the milk from the cow to your refrigerator at home?

Reflect: What are the things you noticed in this book? How are they the same as what we saw on this farm?

FILLER:

COW CHASES TAIL GAME

This is a fun, high-energy group challenge in which people in a line chase one another.

1. Participants form a line, facing the same direction. Each player then puts their hands on the shoulders of the person in front. The last person in line tucks a handkerchief or bandanna into the back of their belt, belt loop, or pocket.

2. The first person in line is the "head" of the cow and their arms are the cow's mouth. The last person in line is the cow's tail.
3. If the cow successfully captures its own tail (by snatching the dangling handkerchief), the head goes to the end of the line and puts the handkerchief tail in the back of their belt, belt loop, or pocket. The second person in line becomes the new head.

Reflect: How did you decide which way to go? Or did you simply follow along?

WRAP UP

Reflect:

- What did we do here today?
- What kinds of things can we make using milk?
- We had a great time here at the farm.

MATERIALS:

Product list
Role play cards

There are many important aspects of agriculture that don't involve the direct production of food. Behind the scenes, harvested foods can be washed, processed, and shipped to almost anywhere.

ESSENTIAL QUESTION:

What are the steps to get food to your plate?

OBJECTIVES:

1. Students will participate in some of the steps needed to process food.
2. Students will be able to discuss the process of getting a food product from a farm to a store for purchasing (growing, harvesting, cleaning, processing, packaging, transporting, and purchasing).

PRE-TRIP ACTIVITIES:

- Brainstorm questions
- Tour Farm
- Harvest Produce

FIELD TRIP ACTIVITIES: FARM

- Meet the Farmer

FIELD TRIP ACTIVITIES: PROCESSING CENTER

- Meet Facilitator
- Tour Facility
- Process Food
- Role Play
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer and processor
- Process food in classroom
- Write a step-by-step procedure to get food from the farm to a lunch tray

FOOD PROCESSOR

STOP ONE: THE FARM

Students will visit a local farm and take a tour of their facilities such as different crop beds, greenhouses, processing warehouse, and storage space. If there is food to glean, the students can harvest the food to process later at the Food Processing Center. (Make sure the farm is close to the processing center if visiting in the same day.)

MEET THE FARMER *10 minutes*

Greeting: Have the students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students the plan for the day – they will be touring the farm and will assist in helping harvest/glean some produce (if possible).

TOUR FARM *20 minutes*

Students will take a tour of the farm with the farmer. Be sure to focus on the places that have a strong connection to harvesting, processing, and packaging the produce. Encourage the students to ask questions about each location.

Reflect: What are the things you didn't expect to see on the farm? Why?

GLEANING *20 minutes*

With the farmer's permission, glean, or harvest, a crop of food at the farm.

1. Go to the part of the farm where the gleaned crop is located.
2. Show the students the proper way to walk through the field, harvest the produce, and carry the harvest out of the field.
3. Break the students into groups with one adult in each group. Give them a time limit and show them the signal you will use to call them back.
4. When the time is up, collect the harvest.

Reflect: Why are we gleaned this crop? What can be done with this crop? Would you eat it?

STOP TWO: PROCESSING CENTER

Students will travel from the farm to a food processing center. There they will tour the facility, process harvested produce, and discuss food systems.

WELCOME *10 minutes*

Greeting: Have the students stand in a circle, and introduce the person who will be facilitating their visit. Have the person give an overview of what they do at the processing center.

Today's Plan: Tell the students that they will go on a tour, process the food they gleaned, and try to connect everything they have done today to a larger food system. If they are not able to harvest produce, see if there is another local farm that is willing to donate 40-50 lbs of produce that the kids can process and give to the school's food service director.

STATIONS *3 stations, 40 minutes each*

Divide the students into three groups. Each group will visit each station for 30 minutes. Each station should be led by an adult either from the facility or the school.

STATION 1: TOUR OF FACILITIES

1. Students will tour the facilities with someone who works at the center and preferably someone who uses the facility regularly.
2. As they are on the tour, encourage them to ask questions.

STATION 2: PROCESSING THE FOOD

1. In this station the students will be using the food that they harvested.
2. Go over the rules of the kitchen, what they will be processing, and how they will be doing it.
3. Break up the processing into three groups so each group can do something. Alternately, you could give each group a smaller amount of food to process so they can participate in every part of the process.
 - a. Wash and blanch
 - b. Cut and cube, put on trays
 - c. Bag and vacuum seal

STATION 3: FOOD SYSTEMS ROLE PLAY

1. Break students into two groups. One group will be a Food Service Director (school cook) and the other group will be Growers/Farmers. All students will receive a Local Food Product List. Let them look over the list for 5 minutes, talk about what they see, and make notes on similarities or differences they may find between different products on the list.
2. Tell everyone that Food Service will need to buy squash every week for the next month. Talk to each group about their individual roles:
 - a. **Food Service Director:** You want to buy as much quality food as you can for the lowest price. You will be purchasing butternut squash for your recipes every week for the next month. You have \$100 set aside to purchase 100 pounds of squash. How would you use butternut squash?

FOOD PROCESSOR

- b. **Grower:** Growers will be divided into three groups: an organic grower with slightly higher prices, a grower who processes their squash into puree, and a conventional grower with slightly lower prices. Each group wants to sell as much butternut squash as they can. How much can you make? How do you expect to compete with lower prices? How would you market your produce?
3. Give each group 5-7 minutes to discuss what their part in the food system would be. Have them use the Local Food Product List to talk about any issues they may foresee (i.e. product prices that might be different, having to choose what to purchase).
4. After the groups have discussed, instruct the Growers to make a circle facing outwards. The Food Service will make a bigger circle, facing inwards. Every Grower should be facing a Food Service Director.
5. Using the questions discussed in their groups, Food Service Directors will have one minute to tell the farmer what they need and what they will use it for. Growers will have 1 minute to try to market their product to the Food Service Director. They will have one more minute for the Food Service Director to tell the Grower if they want to buy from them and why. Encourage them to engage in conversation.
6. After three minutes, have the growers rotate one spot so they are now facing a new Food Service Director. Repeat the conversation in step 5 (regardless of whether or not they made a "sale" in the first round).
7. Repeat steps 5 and 6 one more time so students have an opportunity to talk to three different people.

8. Have students rotate to another space. Announce that you will be changing the pace. You will ask a question and they will discuss the question for three minutes. When the time is up, they will rotate, you will ask another question for them to discuss. Questions to ask:

- a. A new producer with cheaper pricing but not necessarily better quality has appeared on the list. How do Growers compete? How do Food Service Directors decide who to buy from?
- b. A massive flood has struck the area. Where do Food Service Directors get their produce? What do Growers do?
- c. A large corporate distributor is picking up business in the area. Their product may or may not be good; it comes from all over the world; and the prices are constantly fluctuating. What happens?
- d. Growers have promised 20 pounds of butternut squash to each school but are able to deliver up to 40 pounds at the same price point. Would Food Service be interested?
- e. An organic Grower and non-organic Grower have appeared on the list. They have similar produce and prices. Who would Food Service Directors purchase from and why? How could the organic Grower and non-organic Grower influence their decision?

f. Imagine you are a Food Service Director looking for a guaranteed stock of butternut squash to buy throughout the year. Would you look for a discount for reliable bulk purchasing? Would you look for the cheapest whole butternut option or for pureed butternut which would save time, work, and the expense of processing?

9. After students have discussed different scenarios, have them join as one group. Ask the group: What did you gain from this experience? What are some issues that Food Service Directors and Growers face?

Reflect: How do these issues and relationships affect them as students who eat school food?

WRAP UP

Reflect:

What did we do today?
What did you learn?
We had an amazing time here!
Let's thank the farmer.

FOOD PRODUCT LIST: BUTTERNUT SQUASH

Farm	Product	Price
Alice's Organic Farm	Squash, Butternut	\$1.00/lb
Pitcher Mountain Farm	Squash, Butternut	\$0.85/lb
Green Vegetable Farm	Squash Puree	\$6.00/package of 5 lbs

MATERIALS:

Pictures of items found on a farm

Optional nametags of different goat life stages for Farmer, Get Your Goats!

Blank paper

Crayons, pencils

Book: *G is for Goat*
by Patricia Polacco

Two sets of picture cards:

- 1 of babies,
- 1 of parent counterpart

The Northeast Kingdom has a wide array of farms that incorporate animals into everyday operations. Being able to see animals firsthand gives students the opportunity to use their senses to investigate the type of care and thought needed to raise animals for food, fiber, and fuel on a working farm. Goats are often raised for their milk which can be processed into delicious cheese or yogurt.

ESSENTIAL QUESTION:

What does the animal life cycle look like and how do we participate in it?

OBJECTIVES:

1. Students will be able to identify stages of an animal's life cycle.
2. Students will learn the responsibility of caring for animals.
3. Students will develop new vocabulary.

PRE-TRIP ACTIVITIES:

- Brainstorm questions for the farmer
- Go over farm etiquette
- Taste test goat milk and goat cheese

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Farm Tour and Milk Demonstration
- Farmer, Get Your Goats!
- Farm Chore
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Journal entry about the trip
- Taste testing goat milk and/or cheese

GOAT FARM

MEET THE FARMER 10 minutes

Greeting: Have students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students what they will be doing today. For example, "we are going to study animal life cycles. We'll do this by learning about goat babies (kids) and we might even get to help care for them!"

FARM TOUR AND

MILKING DEMONSTRATION 75 minutes

Kids Students will have a scavenger hunt while discovering the goats' living space, their food source, the milking stalls, and the milking room.

1. Give each student a picture of something they may find on the farm. They should hold their picture up, not shout, when they find their item. This is a great opportunity for the farmer to briefly describe why each item is important. Pictures can include:

- a. Water
- b. Sun
- c. Food
- d. Baby animals
- e. Adult animals
- f. Pitchfork
- g. Tractor
- h. Barn
- i. Bug
- j. Grass
- k. Bucket

2. While the farmer is presenting the tour, encourage the students to keep their eyes open.
3. A few great places to see: pasture, birthing pen, barn, grain/hay storage, and the milk storage.
4. Allow time for students to pet and observe other farm animals and babies.

5. After the tour is completed, bring students to the milking parlor for the milking demonstration.
6. Instruct students to be calm and quiet.
7. If possible, introduce students to the milking process. Information to include would be how much milk a goat can produce and how many goats are milked per day.
8. Use your hands to show the students what milking by hand looks like. Use one hand to represent the udder which gets milked by the other hand. Have all students practice on their own hands.
9. The farmer will give a short demonstration of milking a goat by hand or by machine.
10. When the farmer is finished, a few students can try milking, closely helped by the farmer.
11. If applicable at the farm, allow students to compare the two milking methods: hand versus machine. The farmer could explain the pros and cons of each system to the students.

Reflect: How easy do you think it is to milk a goat? Do you think it is the same as milking a cow?

FARMER, GET YOUR GOATS! 25 minutes

Kids will learn about the life cycle of goats and different vocabulary applied to each stage by playing a version of "Sharks and Minnows". This game requires a larger space for the students to run. The educator may choose to use name tags to be worn like a necklace in order to help students identify when they run.

1. Briefly run through the following names and descriptions:
 - a. Nanny or doe – these are the female goats and when called, only the girls should run.

- b. Buck or billy – these are the male goats and when called, only the boys should run.
- c. Kids – these are baby goats and everyone should run.
- d. Tribe, trip, or herd – this is a group of goats and everyone should run.
- e. Bleat – this is the name of the goat vocalization and everyone should run while bleating.
- f. Yearling – one year old goat. If any students have younger siblings, they should run.

2. Gather the students at one end of the space.
3. With the educator as the farmer (shark), call names by saying, "Run _____ (kids, does, bleat), run." The farmer then needs to tag or gather as many goats as possible while the goats run to the other end of the space.
4. Play the game a few times, getting students as familiar with the vocabulary as possible.
5. After the students are familiar with the words, try giving them the definition instead of the vocabulary. "Run _____ (female goats, baby goats, etc), run."
6. Have students take turns being the farmer.
7. After a few rounds of playing the game, give students quiet time by allowing them to draw the life cycle of a goat or another animal on the farm.

Reflect: If goats make bleating sounds, what do other animals sound like?

GOAT FARM

CHORE 30 minutes

Ask the farmer ahead of time what kind of chore needs to be done, if any. Possibilities could be feeding, watering, pen cleaning, etc. This is a good time for the students to get their hands dirty, participate in farming, and interact with the animals.

Reflect: Was the chore difficult? Was it fun?

FILLER:

BOOK: *This G is for Goat*
by Patricia Polacco

Letter by letter, meet cart-pulling goats, clothes-munching goats, head-butting, hill-climbing, tail-wagging goats! Cats, chicks, dogs, and bunnies play along with these friendly goats, joining in the fun. From A is for Apple to Z is for Zoe, these rascally animals just won't stop until they've romped through the whole alphabet.

Reflect: What did the goats in the book look like? Did they look like the goats we saw on the farm?

FILLER:

ANIMAL MATCHING

This activity will help students match baby farm animals to their adult parents.

1. Using a larger space, assign one area as the "barn."
2. Give half of the group pictures of baby animals. The other half of the group gets pictures of the adult counterpart. Instruct the students that they should not share their animal card with other people.
3. All students start in the barn. When you say, "The barn door is open," all the baby animals can escape from the barn and scatter to various parts of the area. The adults must stay in the barn.
4. To get back to the barn safely, the baby animals must find their parent. Both babies and adults need to properly make the right animal sound so the baby can find their parent. They cannot make any other sounds except their animal sound.
5. Once the babies have found their parent in the barn, the two should raise their hands and correctly say the name of the baby animal and the parent animal.

Reflect: How were you able to identify your parent/baby animal sound?

WRAP UP

Reflect:

Tell me one thing you saw on the farm today.

We had a great time here at the farm!

Let's thank the farmer.

MATERIALS:

Scavenger Hunt Bingo Sheet
Blank paper
Pencils
Clip boards
Tarp
Broom

Farmers use a variety of tools and machines to get all of their work done. Tools and machines do not reduce the amount of work to do, but they help get the work done quicker.

ESSENTIAL QUESTION:

What machines help farmers to do their job?

OBJECTIVES:

1. Students will identify simple machines (pulley, wedge, wheel/axel, inclined plane, screw, and lever) on a farm.
2. Students will use simple machines to accomplish a farm task.

PRE-TRIP ACTIVITIES:

- What are grains?
- Research simple machines
- Experiment making simple machines

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Farm Tour/Scavenger Hunt
- Chore/Experiment
- Complex vs. Simple Machines
- Process Grain Using Simple Machines
- Filler: Grain Exploration
- Filler: Be a Machine
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Make a diagram of complex machines seen on the farm and write about how they function
- Cook with wheat or other grains

GRAINS

MEET THE FARMER 10 minutes

Greeting: Have the students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Today, students will be exploring this farm and identifying machines and tools that are used. Specifically, they will be looking at simple machines and what they are used for.

FARM TOUR/SCAVENGER HUNT 30 mins

Students will tour key places on the farm and talk about the grain operation. As students walk around, they will identify the simple machines they see.

1. Talk with the farmer ahead of time about the places on the farm that would be good for the students to see: field, barn, harvesting equipment, processing facilities.
2. Before the tour, go over behavior and safety expectations with the students.
3. Explain to students that they will be touring the farm but also participating in a scavenger hunt. All farms are full of simple machines. A machine is a device that does work. Machines do not decrease the amount of work done, but they do make it easier to do the same amount of work. They make work easier by changing force or distance or by changing the direction of the force.

Have students name examples of simple machines and describe how they work. Give leading questions or help out with answers as necessary.

- a. Lever: a simple machine made with a free end that moves about a fixed point called a fulcrum
 - i. A first class lever is like a teeter-totter or seesaw; one end will lift an object up just as far as the other end is pushed down.
 - Crowbar
 - Balance scale

- ii. A second class lever is like a wheel barrow, the long arms of the wheel barrow are the lever.
 - Wheel barrow
 - Nutcracker

- iii. A third class lever is like a fishing pole; when the pole is given a tug, one end stays still but the other end flips in the air catching the fish.
 - Forearm

- b. Pulley: a simple machine made with a rope, belt or chain wrapped around a grooved wheel. A pulley works two ways. It can change the direction of a force or it can change the amount of force. A fixed pulley changes the direction of the applied force.

- Flag pole

- c. Inclined Plane: an inclined plane is a simple machine with no moving parts. It's simply a straight slanted surface with one end higher than the other.

- Ramp

- d. Wheel and Axle: a wheel and axle is a modification of a pulley. A wheel is fixed to a shaft. The wheel and shaft must work together to be a simple machine. Sometimes the wheel has a crank or handle on it.

- Doorknob
- Roller skates

- e. Wedge: a wedge is a modification of an inclined plane that moves. It is made of two inclined planes put together. Instead of the resistance being moved up an incline plane, the inclined plane moves the resistance.

- Axe

- f. Screw: a screw is a simple machine that is like an inclined plane. It is an inclined plane that wraps around a shaft.

4. As students tour the farm, they will work with a partner. Each set of students will get a clipboard, pencil, and scavenger hunt worksheet. They will check off each simple machine they find and draw the object.
5. During the tour be sure to give students time before or after a stop to look around, talk about what they see with their partner, and draw. Also encourage them to put pencils down when the farmer or other adult is talking.

Reflect: What are some simple machines they found on the farm? How do they make a farmer's job easier to do?

CHORE/EXPERIMENT 25 minutes

Students will help the farmer with a chore while using simple machines.

1. Talk with the farmer ahead of time to see if there is a chore the students can work on. It can be moving grain, weeding, seeding, etc.
2. Explain to students that tools do not decrease the amount of work needed to be done, but it does make the work a lot easier. Tell the students they are going to spend a few minutes doing a chore for the farmer.
3. Provide students with different kinds of tools (hoe, rake, shovel, hands, etc) and ask them to predict which tool will work the best. Why? Have them experiment with the best way to get the work done. Show them how to properly use each tool and go over any safety concerns.
4. Give them 5-8 minutes to do a chore.
5. When time is up, ask them to put the tools down. Gather them in a circle and talk about the best tools to get the work done. Was there a best way to use or position the tool to make it work best?

Reflect: What worked well? What kinds of tools would have worked well?

GRAINS

COMPLEX VS. SIMPLE MACHINE

20 minutes

Students will look at a complex farm machine and find the simple machines.

1. Explain to students that when you combine two or three simple machines, you get a complex machine.
2. Find a piece of farm equipment that the students can safely be around. Have students stand near the equipment and identify the simple machine components they see.
3. Discuss the machine and how it works.
4. Have each student draw a diagram.

Reflect: What are some complex machines that you see or use every day?

PROCESS GRAIN USING

SIMPLE MACHINES 25 minutes

Students will use a well known simple machine to help process grain on the farm.

1. Set up an area for the students to process grain. They will use different body parts and some simple machines to turn the wheat plant into flour.
 - a. Cut the grain down or use dried grain stalks
 - b. Threshing: roll the tops of the grain in between the palms of your hands to release the wheat seeds OR place the grain stalks on a tarp, fold the tarp over, and hit it with a broom or other item to release the wheat seeds
 - c. Winnow: blow or fan the chafe away from the wheat seed
 - d. Grind the wheat
 - e. Taste the flour or the wheat berries (seed)

Reflect: What kinds of tools (real or not) do you think would make this work easier to do?

FILLER:

BE A MACHINE

Students will arrange their bodies into a machine with different parts. They can work individually or in groups. Be sure that they have a chance to share their machine with the rest of the group.

Machine options: wheel barrow, tractor, hammer, baler

WRAP UP

Reflect:

What are some things you did today?

What did you learn?

We had an amazing time here!

MAPLE SUGARING: HISTORY

MATERIALS:

Sap to Syrup Role Play
labels and props

40:1 sap cards

2 sap buckets

Syrup grading kit

Tasting supplies: small cups,
popsicle sticks

Time period images and props

Book:

At Grandpa's Sugar Bush

Maple sugaring has a deep history in Vermont. People may tap a few trees or several sugar bushes. Maple syrup comes from maple trees, whose range reaches only a few states in America and parts of Canada.

ESSENTIAL QUESTION:

What has maple sugaring changed over time in our community?

OBJECTIVES:

1. Students will compare and contrast maple sugaring in three different time periods: Native American, Colonial, and Modern.
2. Students will experience and participate in a part of maple sugaring

PRE-TRIP ACTIVITIES:

- Read native American legends about maple sugaring
- Discuss students' experience with sugaring
- Research how and when sap flows through a tree
- Explore a typical Vermont forest and the various tree species

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Tour the Farm
- Historical Sap Syrup Role Play
- 40:1 Sap Search
- Grading Syrup
- Maple Syrup Taste Test
- Filler: **Book:** *At Grandpa's Sugar Bush*
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Make your own maple syrup
- Cook a recipe using maple
- Write a paper explaining the differences between historical and present day sugaring methods
- Draft a step by step procedure for making syrup from sap

MAPLE SUGARING: HISTORY

MEET THE FARMER *10 minutes*

Greeting: Have the students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about the operation and sugar bush.

Today's Plan: Tell the students what they will be doing today.

FROM SAP TO SYRUP ROLE PLAY *20 mins*

Students reinforce what they have learned about the maple sugaring process by acting out the process using props.

1. Ask for volunteers to act out the following items:
 - a. Maple tree – holds sugar maple branches and bucket that collects sap
 - b. Tree Tappers – measure circumference of tree and tap it.
 - c. Sap collectors – carry buckets of sap to collection tank
 - d. Fire Loader – loads the fire with wood
 - e. Density checker – checks the density of the sap to tell when it is finished turning into syrup by dipping ladle into sap and slowly pouring it out.
 - f. Maple Sap – have students pretend to be sap.
2. Ask the students what they think is the first thing that should be done if someone wants to start sugaring (identify the sugar maple trees). Point out some distinctive qualities of the sugar maple, and then have the student tree volunteers spread out throughout the room.
3. Now that students know which trees are sugar maples, ask them: What comes next? (tapping the trees) How does the sugar maker know which trees to tap or how many taps a tree can have?
4. Explain that a tree must be a certain size before it can be tapped. Sugar makers measure trees by how big around they are (circumference). Show students the circumference chart.

- a. <30 inches then the tree should not be tapped
- b. <54 inches 1 tap
- c. <72 inches 2 taps
- d. >72 inches 3 taps

5. Have tree tappers measure and tap their trees using a string that is labeled with a specific length. After measurements are made, students should pretend to use a hand drill to drill the correct number of holes for the taps.
6. Now that the taps are in, ask the sap collectors to pass out the sap buckets to the trees, wait a moment for them to fill up and then take the buckets to the holding tank/evaporator. Discuss how long it would take for a bucket to fill with sap.
7. Ask the students if they know how many gallons the sap buckets hold. Ask them if they know how many gallons of sap it takes to make a gallon of syrup (40 gallons of sap=1 gallon of syrup). Have the students gather enough sap to make a gallon of syrup.
8. Ask the students how they will turn sap into syrup. Have the fire loaders load fire wood to keep the fires going.
9. Ask students how they will know when the sap is done. (Density checkers should keep checking density with their ladle.)
10. Once sap collectors have collected enough sap to make one gallon of syrup, and the density checkers say the syrup has reached a good consistency, then bottle the syrup.

Reflect: What time of year does sugaring happen in? Why?

40:1 SAP SEARCH *15-20 minutes*

This game can be played as a relay race or as a scavenger hunt, or as a combination of both. If it's a scavenger hunt, you will need to hide the cards before the lesson starts. If it's a relay race, students can scatter the cards in a designated area.

Supplies Needed:

- 40 "Gallons of Sap" cards
- 2 sap buckets

1. Split students into 2 groups. Each group will send one person at a time out into "The Maple Forest" to retrieve one card and return it to their bucket. Students must stay on their snowshoes at all times. Students who are waiting their turn must guard their bucket. If they stray from their bucket, the Sap Monster (a teacher) can steal gallons of sap.
2. The game ends when all 40 gallons of sap have been collected. Each team will count up their gallons of sap to see who collected the most.
3. This activity takes some time. At the end you can discuss the amount of time and energy it takes to collect sap and make maple syrup. Each bucket can weigh up to 20 pounds!

GRADING SYRUP *10 minutes*

Students get to see the difference in various grades of syrup.

1. Explain to the students that after syrup is bottled, it is graded. Show them the graded syrup containers and ask them if they can think of what some of the differences in the various grades might be, and then explain the differences (The Vermont grading system differs from the U.S. system in maintaining a slightly higher standard of product density. Vermont syrup is boiled just a bit longer for a slightly thicker, denser product.):
 - a. The grades roughly correspond to various times within the season when syrups are produced. Grade A Light Amber is mostly made in early-season, while Grade B is mostly made in late-season.
 - b. Typically Grade A (especially Grade A Light Amber) has a milder, more delicate flavor than Grade B, which is very dark with a robust flavor.

MAPLE SUGARING: HISTORY

- c. The dark grades of syrup are primarily used for cooking and baking.

Reflect: Which grade of syrup might taste the best?

MAPLE SYRUP TASTE TEST 15 minutes

Students will get to taste different grades and types of syrup.

1. Prepare tray ahead of time – 1 spoon per student per sample.
2. Pass out a sample of syrup to each student. Have them lick it off their spoon and compare the taste of each grade of syrup. Have them think of descriptive words to describe each grade's flavor.

Reflect: Do the different grades of syrup taste different?

MAPLE SUGARING THROUGH TIME

45-60 minutes

Students learn about the history of maple sugaring by sorting through illustrations and/or props, categorizing them and then placing them in proper sequence.

1. Maple collecting and processing have changed a lot through the years. Explain to students that they will be learning about three different time periods today. Each time period has a visual card for tapping, collecting, transporting, processing, and final product. The cards can be used in as part of a discussion or given to each student to place in the proper location.
2. Sequences are as follows:
 - a. **Native American** (pre-1600)
 - i. Tapping: Stone ax, Maple tree trunk with V shaped gash
 - ii. Collecting: Hewn wooden trough or large birch bark basket
 - iii. Transportation: Walking 4 MPH
 - iv. Processing: Wooden trough with heated stones
 - v. Product: Maple sugar

- vi. Other info
 - Communication: voice
 - Fuel: wood
 - Market: tribe or next tribe
 - Downside: cold, boring and outside, damage to tree

b. Colonial (1600-1800):

- i. Tapping: wooden or metal taps, augers (drills)
- ii. Collecting: wooden or metal bucket
- iii. Transportation: walking horse or oxcart on rough roads 4 MPH or less with heavier loads
- iv. Processing: boiler pot
- v. Product: Maple sugar (typically in block form)

- vi. Other info
 - Communication: slow mail
 - Fuel: wood
 - Market: village or shipped as sugar. In 1818, maple syrup costs half of the price of cane sugar which must come from West Indies.
 - Downside: still cold, boring and outside, but a crop to be harvested when no other farm work can be done
 - 1557-First written record of syrup production

c. **Modern** (1920-today):

- i. Tapping: metal or plastic taps
- ii. Collecting: metal buckets or tubing
- iii. Transportation: Automobiles, trucks, tractors, snowmobiles
- iv. Processing: reverse osmosis, collection pumps increase natural flow of sap

v. Product: maple syrup

- vi. Other info
 - Communication: telephone, radio weather report, satellite weather, contact with buyers via fax and email
 - Fuel: today 20% wood and 80% fuel oil

- Market: the world, retail, bulk orders
- Downside: more roads, more compacted roots, effect of pollution and acid rain on trees, more competition, not much peace in the sugar house with cell phones and laptops

3. Once students know the sequence of maple sugaring, break them into three groups—Native American, Colonial, and Modern. Each group will get physical props. Tell them they will have 5-10 minutes to come up with a wordless play using all of their props to show the class how their time period collected and processed maple products.

4. Give the groups time to come up with a play. Provide direction or leading questions if they need help.

5. When time is up, one group at a time will go to the front of the group and put on their wordless play. Answer questions as they arise.

Reflect: How has the sugaring process changed over time? Does the present day process seem easier or harder? How do you think the final product has changed from past to present?

FILLER:

BOOK: *At Grandpa's Sugar Bush*

by Margaret Carney & Janet Wilson

A young boy and his grandpa share the work of tapping maple trees, collecting and boiling the sap into syrup.

Listening question: What season is sap gathered in to make syrup? Why do you think that is?

Reflect: Who can describe the process of making maple syrup?

WRAP UP

Reflect:

What are three things you did today?

What did you learn?

We had an amazing time here!

Let's thank the farmer.

MAPLE SUGARING: MATH AND SCIENCE

MATERIALS:

Clipboards
Pencils
Field Worksheets
Calculators
Taste Test Cups
Maple Grading Kit
Taps
Auger
40:1 Sap Cards
1 Sap Bucket

Maple sugaring has a deep history in Vermont. People may tap a few trees or several sugar bushes. Maple syrup comes from maple trees, whose range reaches only a few states in America and parts of Canada.

ESSENTIAL QUESTION:

How are math and science used in the process of making maple syrup?

OBJECTIVES:

1. Students will collect and record data in the field relevant to successful sugaring.
2. Students will use math and science to develop conclusions about the sugar bush they are in.

PRE-TRIP ACTIVITIES:

- Discuss students' experience with sugaring
- Research how and when sap flows through a tree
- Explore a typical VT forest and the various tree species

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Field Work
- Finding a Sugar Maple
- Gallons and Gallons
- Managing a Sugar Bush
- Filler: 40:1 Sap Search
- Wrap Up
- Included: Field Worksheets

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Explore woods by school, identify maple trees, and discuss, possible sap/syrup production
- Draft a step-by-step procedure for making syrup from sap

MAPLE SUGARING: MATH & SCIENCE

MEET THE FARMER *10 minutes*

Greeting: Have the students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students that they will be touring the maple farm and doing field work to learn about the sugaring process. They will experience how maple syrup is made by combining indigenous wisdom with modern science, math and technology.

FIELD WORK *90 minutes*

Students are broken into teams and accompanied by an adult. Students will spend 30 minutes at each station before rotating allowing 2-3 minutes for transition time.

STATION 1: FINDING A SUGAR MAPLE TREE

Take students to a spot in the sugarbush that has a variety of tree species, including maples.

1. Tree identification:

- Ask the students what they can use to identify the trees around them. They can use bark, lichen on the bark, leaves on the ground, leaves on the trees, and taps in the trees.
- Why is tree identification important? Obviously, knowing where the maple trees are in a sugar bush is important in tapping and making maple syrup. Other trees make sap, but maple tastes the best. Sugar maples produce a good tasting sap longer than other maple trees because they take the longest to bud. Once a tree buds, the sap changes flavors.
- Have students point out all of the trees they can identify.

2. Species Distribution:

- Now that students can identify a maple tree, we will see how prevalent they are in this forest by doing a random plot sample.
- Students will help the instructor rope off a random plot (about 20'x20') using rope, flags, or any other marking device. Students will move inside the plot to identify and measure mature trees and saplings.
- Students will measure and record maple tree circumferences by placing a measuring tape chest height around the tree. They will record the measurement on their field work form.
- Math: based on the tree circumference, students record how many taps each tree can have. 30"=1 tap, 54"=2taps, ≥ 72 "=3 taps. If a tree is less than 30", it is considered a sapling and shouldn't be tapped.
- More math: Students find how many taps are possible within the random plot sample. (add numbers in the row "Taps possible")

3. Sugarbush management:

- When students have mostly finished their field work, gather them together to discuss their findings.
- What does this random plot sample tell us about the forest as a whole, and about the sugar bush?
- What is a healthy forest? What do our findings tell us about the health of this forest?
- What is a healthy sugar bush? What do our findings tell us about a healthy sugar bush?
- If this was your sugar bush, what would you do to manage it?

STATION 2: GALLONS AND GALLONS

Take students to a spot near the evaporator. The students can go inside and get a quick tour to learn how syrup is made from sap.

1. Taste test:

- As students leave the sugar house, have them taste sap from a tree and the boiled sap that is now syrup.
- How are they the same? How are they different?
- Sap typically is around 2% sugar and maple syrup is 66.5% sugar. The sap is boiled which reduces the water content and makes it sweeter. Some trees produce sweeter sap than others and sugar content typically varies between 2 and 2.75% sugar. Some super-sweet trees have sap with as much as 10.5%!
- Alternative: Compare different grades, Fancy, Grade A Medium, Grade A Dark, Grade B. How do they look and taste different?

2. Syrup in the Trees:

- Math: Students calculate the # gallons of sap needed to create 1 gallon of syrup based on the results from the hydrometer and Jones Rule of 86. Jones's Rule of 86: Divide the sap sugar content into the number 86 to determine the gallons of sap needed to produce one gallon of syrup. 1G syrup=_____G sap
- * Display empty gallon jugs for students to get a sense of the scale.
- More math: Inform the students that each tap on a tree yields about 10 gallons of sap per season. (Have them record this). Then ask, "About how many taps would you need to make 1 gallon of syrup?" The answer is about 4. To find this answer divide the #gallons (g) of sap in 1g syrup \div #g sap per tap. For example, if there are 43g sap in 1g syrup then $43/10=4.3$

MAPLE SUGARING: MATH & SCIENCE

- Even more math: Ask the students, "Assume that there are 1200 maple trees/ acre on this maple syrup farm and the entire farm contains 100 acres of tapped maple trees. How many gallons of maple syrup could we expect this farm to produce?" To solve this there are three equations to complete:

- i. First, find the total # of trees on the farm ($1200 \times 100 = 120,000$).
- ii. Second, find the gallons of sap that the trees produce ($12,000 \times 10 = 120,000$ g sap).
- iii. Third, convert gallons of sap to syrup using Jones's Rule of 86 ($120,000 / 86 = 1,395.35$ g syrup).

**Explain that when multiplying by a number that ends in zero, you just add the quantity of zeroes on the end of the other number being multiplied.*

**To challenge the students further, each tree on the farm could have two taps.*

STATION 3: MANAGING A SUGAR BUSH

(It is preferable that students can tap a tree) Students will role-play the process of the tree creating and moving sap. Through this, they will learn how to best tap a tree.

1. Maximizing sap production:

- Students consider forest management practices needed to increase sap production. How can sugar bush managers (sugar makers) increase sap production? What does a tree need? (Sunlight, soil, water and space).

- Role-play a tree (demonstrate for students): students begin standing tall with arms at sides

a. Roots: students squat near ground and rise slowly. Legs grow like roots on a tree. Roots spread far and wide (students widen stance). They collect and essential nutrients like water and nitrogen and send it up the tree.

b. Trunk: students put hands on hips. The trunk supports the rest of the tree. It helps the tree grow tall and acts as a super highway for nutrients moving between the roots and branches.

c. Branches: students clench fingers and raise arms to the sides to form a T. Branches allow leaves to spread far and wide so they can soak up as much sunlight as possible.

d. Crown: students spread fingers wide and create 90° right angles with their arms by bending their elbows. Wide spreading crowns produce more sap.

- Students visually identify trees with wide spreading branches then make assessments. Does this tree need more space? Can it be tapped?

2. Science of tapping:

- People have used many different methods to tap maple trees and collect sap in the past. Have the students brainstorm what those methods are. As they call them out, hold up a prop (if available) and discuss who used it and when.

- Ax
- Auger
- Drill

3. Students tap a tree:

- After demonstration and under supervision, students drill the hole, scrape it out, tap in a spile, connect the spile to tubing or hang a bucket. Background: Trees are tapped 2-3 inches into the cambium with a slight upward angle so that sap will flow out easily.

4. Alternative to Tapping:

- Students measure and record how many steps it takes to get from the tree to the end of the tubing.

FILLER:

40:1 SAP SEARCH

(See page 33 for directions)

This game can be played as a relay race or as a scavenger hunt, or a combination of both. If it's a scavenger hunt, you will need to hide the gallons of sap before the lesson starts. If it's a relay race, students can scatter the gallons of sap in a designated area.

WRAP UP

Reflect:

We had an amazing time here!
Let's thank the farmer.

MAPLE SUGARING: MATH & SCIENCE

MAPLE SYRUP: FIELD DATA SHEET

Sample plot size: _____ x _____

TREE SPECIES	SAPLING OR MATURE	SUGAR MAPLE CIRCUMFERENCE (IN.)	NUMBER OF TAPS POSSIBLE

*30"=1 tap, 54"=2 taps, ≥72"=3 taps

Total taps possible in sample plot: _____

MAPLE SUGARING: MATH & SCIENCE

SWEET SAP

1. Maple sap is typically between 2 and 2.75% sugar content. Some super-sweet trees have been as high as 10.5%!

My maple tree's sugar content _____.

2. How many gallons of your tree's sap go into one gallon of syrup?

_____ gallons sap = 1 gallon syrup

** Jones's Rule of 86: Divide your sap sugar content into the number 86 to determine the gallons of sap needed to produce one gallon of syrup.*

3. How many trees would you need to tap to produce enough sap for one gallon of syrup?

_____ taps = 1 gallon syrup

Each tap on a tree yields about _____ gallons of sap per season.

** Number of gallons of sap in one gallon of syrup ÷ number of gallons of sap per tap*

4. Assume that there are 1200 maple trees per acre on this maple syrup farm and the entire farm contains 100 acres of tapped maple trees. How many gallons of maple syrup does it produce?

Total number of trees on the farm = _____.

** trees X acres*

Number of gallons of sap that trees on the farm produce = _____.

** Number of gallons sap per tap X trees*

Number of gallons of syrup the farm produces per season = _____.

** Jones's Rule of 86*

METHANE DIGESTER, ALTERNATIVE ENERGY

MATERIALS:

Notebook
Items for role play

Farms that raise animals must deal with the waste the animals produce. Farms that use methane digesters use animal waste to make electricity.

ESSENTIAL QUESTION:

What is the connection between cow manure and you?

OBJECTIVES:

1. Students will be able to explain the basic process in a manure digester.
2. Students will be able to state what the main difference is between the terms “aerobic” and “anaerobic.”
3. Students will be able to name three benefits of using a manure digester.

PRE-TRIP ACTIVITIES:

- Research Methane Digesters
- Read: *Clarabelle: Making Milk and So Much More*
- Discuss the inputs and outputs of a dairy or beef farm and the responsibility of the farmer

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Farm Tour
- Methane Digester Role-Play
- Filler: Cow Power Photo

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Write a step by step procedure about how a methane digester works

METHANE DIGESTER, ALT. ENERGY

MEET THE FARMER *10 minutes*

Greeting: Have the students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students what they will be doing today.

FARM TOUR *30 minutes*

Students will observe connections between the things they see and themselves while going on a tour of the farm.

1. Hold up a notebook to the students. Point to a tree. Ask the students how the two are related. The notebook is made of paper from the tree. Point to the notebook and ask the students to point to themselves. Ask how the two are related. The notebook allows us to write things down. Lastly, have students point toward themselves and toward the methane digester. Today we will discover the relationship between the methane digester and other aspects found on the farm.
2. Explain to students that they will be going on a tour of the farm. They should be good listeners and observers as they tour with the farm. They should think of how things are connected. Consider specifically how using the manure digester affects:
 - a. the farm operations
 - b. farm production
 - c. farm living

For example, how is a manure digester related to a refrigerator? What about the grass?

3. Tour the farm with the farmer, encouraging questions and observations throughout.

Reflect: What are the connections you saw during the tour?

METHANE DIGESTER, ALT. ENERGY

METHANE DIGESTOR ROLE-PLAY

30 minutes

Students will role-play the process of the methane digester in order to understand how it works. This can be done before, during, or after the students see the methane digester.

1. The main reason for this field trip is to see how today's farmers might deal with handling all that manure that is produced by their cows (or hogs, chickens, etc.). Tell the students that they will be recreating the methane digester process as a class. For the role play you will need:
 - a. A sturdy, tied cord to create an outline on the ground to serve as the digester tank, approx. 10 feet in diameter
 - b. 3-5 neck tags with "Manure" written on the front and "Methane-CH₄" written on the back
 - c. 3-5 neck tags with "Carbon Dioxide-CO₂" written on the front
 - d. 3-5 cards with "Biogas" written on the front and "approx. 70% CH₄; approx. 30% CO₂" written on the back
 - e. 3-5 neck tags with "Bacteria" written on the front
 - f. examples of byproducts: bedding, potting soil, planting pots, fertilizer
2. Present the idea of a manure digester. Ask the students if they have heard of a manure digester and what they might know about it. Emphasize that manure can be transformed into power, hence, cow power!
3. Lay the cord out on the ground. As you are doing this, explain that there are four main components to the manure digesting system: collecting the manure, the digester itself, processing the biogas that is produced into power, and processing what is left over. The cord that has just been placed on the ground is the digester, the tank where it all happens.
4. Ask for a few volunteers. Put the "Manure" signs around their necks, then collect them, so to speak, and place them in the digester. At this time explain that this is where the action happens, where the manure is turned into a usable biogas via anaerobic digestion. Have everyone repeat the word "biogas." Discuss the difference between aerobic and anaerobic.
5. Announce that "Now we need our bacteria to come in," and place a "Bacteria" sign around your bacteria volunteer's neck. Demonstrate by going into the tank, mock "eating" one of the manure students, and instructing the manure student to turn their sign around to the "methane-CH₄" side. Then hand the manure student a "CO₂" sign, have them choose someone to join them in the tank, and have them place the CO₂ sign around the chosen person's neck. The teacher will then hand them, and have them both hold, a "Biogas" sign. Explain what is happening as you are going through this process.
6. Choose corresponding number of students to take a turn being the bacteria, placing signs around their necks, to students that are still needing to be broken down in the tank and have them repeat the process that was just demonstrated by the teacher. When all the manure has been transformed into biogas, stop and take a moment to reiterate the concepts that were explained during the teacher demonstration.
7. Rally the biogas and have them follow you out of the tank. Teacher should say, "This biogas is then used as fuel for generators which produces electricity that is often used to heat the barn and/or other structures. We can think of this as 'cow power.'"
8. Explain that byproducts are produced as well and show the students the examples of fertilizers, bedding, potting soil, and planting pots.
9. Answer any questions, collect the props, and proceed with the farm tour.

Reflect: How do you explain this process in your own words? What are other things that go through a process and turn into something completely different at the end?

FILLER:

COW POWER PHOTO

Students will pose in the shape of a letter of the title "COW POWER" This can be adapted depending on the number of students. For instance, two or more students can represent a single letter, or add the letters ED to make "POWERED".

WRAP UP

Reflect:

What is something you learned today?
We had an amazing time here!
Let's thank the farmer.

For more info, visit:

<http://www.cvps.com/cowpower/Cow%20Power%20home.html>

MATERIALS:

Poultry grab bag items:

feather duster, chicken soup, egg carton, jar of water, oyster shells, corn kernels, hand rakes, fake insect

Dress up items: feathers, wings, beak, comb, wattle, feet, gizzard

Feather examples: flight, down, contour

Book: *Chicken's Aren't the Only Ones*

The Northeast Kingdom has a wide array of farms that incorporate animals into everyday operations. Chickens are raised for both meat and eggs and are quirky creatures that are often endearing to students.

ESSENTIAL QUESTION:

What would we see if we followed a chicken around for a day?

OBJECTIVES:

1. Students will compare and contrast a chicken's needs to their own.
2. Students will name products that come from a chicken.

PRE-TRIP ACTIVITIES:

- Discuss what to expect on a chicken farm
- Compare and contrast photos of different chicken breeds

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Farm Tour
- Dress Up a Chicken
- Chicken Grab Bag
- Feathers, Feathers, Feathers
- Filler: Book: *Chicken's Aren't the Only Ones*
- Filler: Game: Chickens and Coyote Tag
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Create your own chicken
- Incubate and hatch chickens
- Use eggs in a recipe

POULTRY

MEET THE FARMER *10 minutes*

Greeting: Have the students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students what they will be doing today.

FARM TOUR *10 minutes*

Students will go on a tour of the farm. The tour can be done as a whole class or as a station for a small group. Talk with the farmer ahead of time about which parts of the farm to include.

Reflect: What is something you saw on the farm tour?

POULTRY PRODUCTS GRAB BAG

20 minutes

Students will discover a plethora of products that come from chickens, and will learn what chickens need to be healthy.

1. Ask students why a farmer would want chickens on their farm. Have them share their answers.
2. As students answer, pull the corresponding products out of the bag:
 - a. Feathers: Hold up a feather duster and ask students if they have ever helped to clean with a feather duster. Have they ever used a down comforter? See if any of the students are wearing a down coat.
 - b. Meat: Hold up a can of chicken noodle soup and ask students if they have ever eaten chicken before. What are their favorite chicken recipes?
 - c. Eggs: Hold up an egg and ask students if they've ever eaten eggs. Brainstorm what kinds of foods are prepared with eggs (cakes, cookies, quiche, some breads).

3. Ask students to brainstorm what a chicken needs to be healthy. If they have already seen chickens, what did they notice the chickens were eating? What do they think chickens spend their time doing?
 - a. Jar of water: Chickens need to drink water, just as people do. Ask students if they have ever seen a chicken drinking water.
 - b. Oyster shells: Chickens need vitamins and nutrients just as people do. Oyster shells from the sea are fed to chickens to make their shells strong. Ask students if they have ever cracked an egg. Was it strong?
 - c. Corn kernels: Chickens love to eat corn! It can be found in their chicken feed. (Extension: have students grind corn kernels on a stump with a rock and feed it to chickens.)
 - d. Hand Rake: Ask students to describe a chicken foot. Does it look similar to the rake? Chickens help the farmer to have healthy soil by "aerating" the soil with their feet when they look for food.
 - e. Insects: Farmers love chickens because they eat insects, many of which are harmful to crops.
4. Give the students time to observe the chickens and look for all of the things you talked about paying attention to: how they eat, drink, and move.

Reflect: How are chickens different than us?

DRESS UP A CHICKEN *20 minutes*

Students will be introduced to the distinguishing characteristics of a chicken.

1. Explain to the students that you will need a brave volunteer to help teach her fellow students about chicken anatomy. Ask for a volunteer to come to the front of the room and whisper in their ear that you will be dressing them up as a chicken!

2. Ask the students if they can think of body parts or characteristics of a chicken that make it a chicken. As they say each characteristic, put the prop onto the volunteer and talk about its purpose. Once all props are on the volunteer, add more distinguishing characteristics that have to do with eating, moving, sounds etc.
3. Props:
 - a. Feathers (feathers) – Chickens have feathers for protection from weather conditions such as rain, cold, and sun. Feathers also protect the body from injury. The color of feathers depends on the breed of chicken. There are three types of feathers: flight feathers, down feathers, and contour feathers.
 - b. Wings (cardboard wings with string/rubber band/tape for handle) – Chickens are not good flyers and can only fly short distances.
 - c. Beak (paper cone with string or cone birthday hat) – To help it peck its way out of the egg, a baby chick has an egg tooth on its beak. This falls off when it is no longer needed, as soon as the egg is cracked open. Once out, a chicken uses its beak primarily for eating and grooming.
 - d. Comb (hair comb glued to head band) – The comb is a fleshy growth on the top of the chicken head. Both males and females have them; the male's is typically larger. Combs are different shapes, sizes and colors for different breeds, but all serve the same purpose. Blood circulates between the comb and the wattle cooling the chicken down.
 - e. Wattles (deflated balloons on a string) – The wattle is a fleshy growth located under the chin. Both males and females have them; each chicken has two. Along with the comb, the wattles assist with cooling the chicken during hot weather.

POULTRY

- f. Feet (2 hand cultivators held so that the handle becomes the fourth toe) – Chickens have 16 bones in their feet making up 4 toes. The third toe is the longest, while the fourth toe is claw-like. Many birds have webbed toes, however, the chicken does not.
- g. Gizzard (a felt stomach with three chambers and stones glued to one of the chambers to simulate the stones grinding) – Chickens do not digest food the same way we do. They swallow rocks that help break up the food they eat. (Extension: have them use rocks to grind up sticks, grass, and other debris.)

Reflect: Was it fun to dress up as a chicken? Would it be fun to be a chicken?! What are some parts that a chicken has that we don't and what are some parts that we have in common?

FEATHERS, FEATHERS, FEATHERS

20 minutes

Students will learn about the kinds and parts of feathers through hands-on investigation.

1. Tell the students that all birds have three kinds of feathers.
2. Ask the students to look around and see if they see any feathers on the ground. Pair up students and tell them that they have 2 minutes to look around with their partner and collect as many feathers as they can. Remind them to only pick up feathers that appear free of chicken waste.
3. After two minutes call students back. Ask them to take a minute to examine their feathers to see if they notice any differences or similarities between the feathers that they've collected. Can they guess what job each feather may have?
4. Explain that there are three basic kinds of feathers:
 - a. Flight feathers: found on the wings and tail. They have strong shafts run-

ning the entire length of the feather, with flat webs on two opposite sides. This makes a lightweight but solid surface for flight.

- b. Down feathers: found close to a bird's skin and body. They have very short shafts with many noninterlocking barbs to create dead air spaces for insulation.
 - c. Contour feathers: found over down feathers. They help streamline the bird and, along with the flight feathers, carry the colors and patterns distinctive of the species:
5. Encourage the students to examine their feathers to see which type of feather they collected. Encourage them to use hand lenses if needed.
 6. Close examination of a feather reveals three parts.
 - a. The shaft: the central hollow tube that gives the feather its rigidity
 - b. The barbs: the parallel strands that attach on either side of the shaft to create the feather's flat surface, or vane
 - c. The barbs: pieces that run along the barbs and connect them together, with tiny hooks on one side and bumps on the other.
 7. Have students gently pull apart the web of the feather. Students can use hand lenses to see the tiny barbs that project from the barb. Ask them to try to zip the feather back together by pinching and drawing their fingers from the shaft to the outer edge.

Reflect: Do you notice all of the differences in the feathers? What do you see?

FILLER:

BOOK: *Chicken's Aren't the Only Ones*
by Ruth Heller

The book points out one of the chicken's most common farm products: eggs; and illustrates that chickens aren't the only ones that lay eggs!

Listening Question: Can anyone remember what an animal is called if it lays eggs?

Reflect: What are some other kinds of poultry that lay eggs? What about other kinds of animals? Do we use any other animal's eggs for anything?

FILLER:

CHICKENS & COYOTE TAG

Students will play a simple tag game.

1. Set the boundaries for the game. Two parallel sides will be safety zones, or chicken coops. The object of the game is for the chickens to get from one chicken coop to the other without getting tagged by the coyote.
2. Pick one student to be a coyote. They will stand in the middle between the coops. They are not allowed to go into the chicken coops.
3. Everyone else is a chicken and should all stand in one chicken coop.
4. When the coyote howls, all chickens must run from the chicken coop they are in to the one on the other side of the coyote while staying inside the boundaries. If they are tagged they must sit or kneel on the ground. Once everyone has either been tagged or is "inside" the coop, a new round will start.
5. Any chicken that was tagged is now a new coyote and can help tag chickens when they cross the field. All coyotes will stand in the middle of the field, the original coyote will howl, and the chickens will cross.
6. When all but one chicken is left, the game is over. The single chicken now becomes the new coyote and a new game can begin.

WRAP UP

Reflect:

We had an amazing time here!
Let's thank the farmer.

MATERIALS:

Spray bottle
Large knife
(to cut open a pumpkin)
Bowl
Spoon (to scoop seeds)
Markers

Book: *Pumpkin Circle*

When fall comes, pumpkins start to appear in farm stands, on people's doorsteps, and in pies on the thanksgiving dinner table! Everyone loves a pumpkin.

ESSENTIAL QUESTION:

What are the parts of a pumpkin plant?

OBJECTIVES:

1. Students will use all senses to observe and learn about the parts of a pumpkin plant.
2. Students will learn about the life cycle of a pumpkin.

PRE-TRIP ACTIVITIES:

- What is a pumpkin?
- What do we do with pumpkins?
- Define Terms: winter squash, cucurbit, jack o'lantern, pie pumpkin

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Pumpkin Patch Observation
- Pumpkin Life Cycle Role Play
- Sorting Pumpkins
- Pumpkin dissection
- Filler: **Book:** *Pumpkin Circle*
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Cook with pumpkin/pumpkin seeds
- Compare and contrast a pumpkin with other types of squash
- Carve pumpkins

PUMPKIN PATCH

MEET THE FARMER *10 minutes*

Greeting: Have students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students what they will be doing today. For example, "we will be spending some time out in the pumpkin patch getting to know the plants and learning about how pumpkins grow. Then we will do some activities where we will get to look at and sort a collection of pumpkins. And you will all get to take a pumpkin home with you at the end of the day!"

PUMPKIN PATCH OBSERVATION

20 minutes

Students will use many senses to observe the pumpkin plants in the pumpkin patch.

1. Lead the class out into the pumpkin field and direct them to each find their own spot where they will sit and observe silently for five minutes. Tell them to use their senses (SIGHT, HEARING, SMELL, TOUCH – not taste) to get to know the pumpkin plants and the environment they are growing in.
2. After five minutes, call the group together.
3. Go through the senses and ask the kids to share something they observed using each sense.

Reflect: What different parts of the pumpkin plant did you observe?

PUMPKIN LIFE CYCLE ROLE PLAY

15 minutes

Find an open space where the kids can spread out at least an arms-distance apart.

1. Tell the students that they are going to pretend to be pumpkin seeds, and as you tell the story of their life cycle, they will act it out.
2. Pumpkin Life Cycle Story:
 - It is autumn, and each one of you is a seed that the farmer has saved from the pumpkin harvest. (kids curl up into a tight ball)
 - The farmer puts you in a cool dark place to wait through the winter until it is time to plant in the spring. You wait/hibernate patiently through the cold winter months, dreaming of the warmer days to come. (kids can snore, twiddle thumbs...)
 - Finally, winter thaws into spring and the farmer prepares the fields for planting.
 - The farmer brings the pumpkin seeds out to the field and plants each one in the soil. As the sun warms up the earth around each little seed, and the spring rains fall and soaks into the soil, the seeds start to wake up! (students wiggle around and yawn, but don't get up yet)
 - The seeds are thirsty after their long winter sleep, so they soak up some rain water from the soil. They begin to swell and the seeds pop out a root to drink up even more water. (mist kids with a spray bottle – students stretch out a leg (root) to slurp up the water)
 - Now the seeds start to uncurl and they eat some of the food they have stored inside of them to get energy to keep growing. (kids pretend to eat)

- With this energy they send a shoot up through the soil. It grows up and up until it breaks through the surface of the ground into the warm sunshine! (kids stretch hands into the air and slowly stand up)
 - The little sprouts grow taller and taller and unfurl some leaves to collect the sunshine. (students stretch out arms and sway in the breeze)
 - The pumpkin plants keep growing and send out curling vines to secure themselves in place.
 - Now it is summertime and the pumpkin plants start to form flowers. (students spread out fingers to make flowers)
 - Busy bees come around and pollinate all the flowers on the pumpkin plants. (teacher buzzes around pollinating the flowers)
 - From some of the flowers a pumpkin starts to grow. (students mimic the growth of the pumpkin starting small with just their hands and then widening their arms to indicate the pumpkins growing bigger and bigger)
 - As fall approaches, the pumpkins grow bigger and bigger and bigger!
 - The leaves and vines start to shrivel and dry, but the pumpkins are turning from green to bright orange.
 - Now the farmer comes and selects the biggest and plumpest pumpkins. The farmer picks it from the vine, and cuts it open to find...SEEDS!! (Students pretend to break open.) The farmer will save a few seeds to plant next year's pumpkin patch.
3. If you have time, try a high-speed version of the role-play.

Reflect: What do pumpkin seeds need to grow?

PUMPKIN PATCH

SORTING PUMPKINS 30 minutes

Students will sort pumpkins according to different categories.

1. Have students gather around a collection of pumpkins and let them each select one pumpkin from the pile.
2. Have the students form a line with their pumpkins.
3. Ask them how they might sort themselves, holding their pumpkins, into a specific order based on characteristics of the pumpkins they have selected.
4. Choose a characteristic to start with and tell the students they have three minutes to line up with their pumpkins according to _____. (size, length of stem, color, height...)
5. If there is a scale at the farm, they could each weigh their pumpkins and sort them holding their pumpkins according to weight. You could even write the weight on the pumpkin with a marker.

Reflect: Are all pumpkins the same? What characteristics do you look for in selecting a pumpkin?

PUMPKIN DISSECTION/SEED COUNT

20 minutes

Ask the farmer ahead of time for a pumpkin that you can dissect with the class (can be an imperfect pumpkin they might not be able to sell as easily).

1. Have the kids sit in a circle on the grass, or at a picnic table.
2. Ask the students what they think is inside the pumpkin.
3. Can they predict how many seeds are inside this pumpkin?
4. Cut open the pumpkin in front of the students and let them look at the inside of the pumpkin.
5. Scoop out the seeds into a bowl.
6. As a class, count the seeds inside the pumpkin. You can divide the seeds up among a few groups and add the totals together, or count out loud as a whole group as you pick each seed out of the pumpkin.
7. How close was your guess to the actual number of seeds? What can we do with the seeds now?

Reflect: How many pumpkins could grow from the seeds inside this pumpkin?

FILLER:

BOOK: *Pumpkin Circle: The Story of a Garden* by George Levenson

This book discusses the life cycle of a pumpkin plant – the development of a pumpkin seed into a plant, pumpkin, jack o’lantern, and then its conversion back to seed again. Photos show a child sitting on a huge mound of pumpkins, a magnified view of the inside of the fruit with its pulp and seeds, tendrils of a plant stretching across two pages, a view into the center of a blossom, and the lighted grin of a beautiful jack-o’-lantern.

Listening questions: The book is called *Pumpkin Circle*. What do you think that means? What are some of the different parts of the pumpkin plant besides the pumpkin?

Reflect: What parts of the pumpkin life cycle did the students observe today in the pumpkin patch?

WRAP UP

Reflect:

We had an amazing time here at the pumpkin patch!
Let’s thank the farmer.

MATERIALS:

Seed packets
Seed Sort Cards
(pictures & plant names)

Most of the fruits and vegetables we eat are grown from seeds. There is an increasing number and variety of produce items available to us as a result of selective breeding and genetic engineering.

ESSENTIAL QUESTION:

How is the process of growing plants to harvest seed different from growing them to harvest their vegetables?

OBJECTIVES:

1. Students will learn about selecting for desired traits in plants.
2. Students will be able to name the steps involved in the seed-saving process.

PRE-TRIP ACTIVITIES:

- What is a seed?
- Define Terms: germinate, seed coat, dormant, cotyledon, seed saving, annual, biennial, perennial, hybrid, heirloom, genetically modified organism

FIELD TRIP ACTIVITIES:

- Introduction to the Farm
- Rock Paper Scissors...Seed!
- Seed Packet Scavenger Hunt / Seed Sort
- Crop Tour
- Seed Processing Tour
- Farm Work Project
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Plant seeds
- Cooking with seeds
- Design your own seed
- Saving seed project

SEEDS

MEET THE FARMER *10 minutes*

Greeting: Have students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about themselves and their farm.

Today's Plan: Tell the students what they will be doing today. For example, "we will be learning about the process of commercial seed saving. We will be exploring both the growing phase and the seed-processing/storing part of this process."

ROCK, PAPER, SCISSORS...SEED!

10-15 minutes

This game is a quick warm-up and refresher of the basic plant life cycle starting from a seed.

1. Go over the phases of the plant life cycle: seed, plant, flower, fruit, seed.
2. Assign a movement for each stage in the cycle
 - Seed-crouched on the ground
 - Plant-standing up
 - Flower-standing with one hand in the air open like a flower
 - Fruit-standing with arms making a circle above head
3. Go over the rules of rock, paper, scissors (RPS).
4. Everyone begins as a seed, assuming the position/movement designated for this stage. Seeds mingle around to find another seed to play RPS with. The winner advances to the next stage in the cycle (a plant) while the loser remains a seed.
5. Now plants find plants and seeds find seeds and play RPS with each other, either advancing or staying the same. Play continues as participants advance through all the stages in the cycle.
6. When a fruit wins at RPS it cycles back to the seed stage and starts all over again.

7. Call an end to the game after a few minutes of play. Find out where the participants have ended up in the cycle. Did anyone remain a seed throughout the entire game? Did anyone make it through the cycle more than once? (There are no real winners and losers.)
8. Ask the students to think about and answer these questions:
 - At what stage in the plant life cycle would we harvest the seeds?
 - When do we harvest the vegetables?
 - Do all plants go through the same stages? NO – Talk about the difference between annuals, perennials, and biennials.

SEED PACKET SCAVENGER HUNT

15 minutes

Students will look closely at the information on a seed packet to begin to understand the various characteristics of plants that can be selected for when saving seeds.

1. Split class into groups of 2-3.
2. Pass out seed packets (using seeds varieties that are being grown on the farm), 1-2 seed packets per group.
3. Ask them what they see or notice.
4. Make sure to keep a running list on a white board of items (traits) that kids spot.
5. Discuss things that might be confusing, i.e. USDA, organic, germination.
6. Allow students to compare numbers they might find: days to germination, spacing requirement, height, sun.

Reflect: What types of seed/plant traits are important? Why might we choose one variety of seed or one plant trait over another (color, size, flower, taste, storage...)? We know what the vegetables that we harvest from various plants look like, but what do the plants themselves look like?

SEED SORT

15 minutes

To learn more about seeds, students will match seeds to pictures of the plants that they come from.

1. Divide the students up into three groups.
2. Go over the cards as a group so each student understands the activity.
3. Give each student in Group 1 a plant name card.
4. Give each student in Group 2 a bag with a seed.
5. Give each student in Group 3 a picture of a plant.
6. Instruct the students to group themselves together by plant. Each group should have three students representing the seed, plant name, and plant picture.

Reflect: Seeds can come in many different shapes and sizes.

SEEDS

CROP TOUR *30 minutes*

The farmer will give a tour of the crop fields and trial gardens, talking about how plants are selected for seed saving, what traits are selected for, how plants are cared for, at what stage in the growth the seeds are harvested, how harvesting happens, etc.

1. Have the students bring their seed packets with them and ask the farmer to talk about each student's specific plant.
2. Have the students think about what traits they might select for to create their ideal vegetable.
3. Discuss the differences between heirloom and hybrid varieties.

Heirloom: Heirloom seeds are descendants of an ancient variety, an heirloom will remain true to its parent plant and produce the same vegetables year after year.

Hybrid: A seed that was produced by crossbreeding plants to produce a plant with specific characteristics from the two plants. Seeds from a hybrid plant may not produce the same characteristics from its parent because it is not stable and may favor one parent's traits over the other. Seed companies work to develop the hybrids for commercial characteristics, such as toughness for shipping purposes, ripening qualities, and cosmetic appearances. The seed saved from hybrid plants will most likely revert to one of the original parent plants from which it was formulated. As a result, hybrid seeds must be purchased from a seed company every year.

4. Discuss the difference between selective plant breeding and genetically modified seeds.

Selective Breeding: the process of developing a plant based on selecting desirable characteristics of the parent (color, size, resistance to weather).

Genetically Modified Organisms: genetic material from one species of plant is introduced to an entirely different species through human intervention.

Reflect: How do the plants look different at the point you harvest the vegetable vs. the point at which you harvest the seed? Do all plants produce their seeds in the first year of growth?

SEED PROCESSING TOUR

(if applicable) 30 minutes

If the seed farm has seed processing facilities, have the farmer give a tour of this aspect of the operation discussing the processes and tools used for harvesting, extracting, cleaning and packing seeds.

Reflect: Are all seeds processed in the same way?

FARM WORK PROJECT

30 minutes

Students will help the farmer with a work project on the farm related to seed saving, processing, sorting, growing, etc. Establish with the farmer ahead of time what kind of work needs to be done that day. This work project could coincide with one of the tours above. Ask kids to think about the following questions while participating in the work:

- How might this task be different if we were growing these plants for food rather than seeds?
- How would this process be different if these were/were not organically grown seeds? Genetically modified?
- Do all seeds require the same conditions for storage, viability, growth?

WRAP UP

Reflect:

We had a great time here at the vegetable farm! Let's thank the farmer.

MATERIALS:

Blindfolds
Clip Boards
Paper
Pencils
Colored Pencils
Magnifying Glasses
Rulers or Measuring Tape
Cutting Board
Knife
Napkins or Plates

Book: *Tops & Bottoms*

All fruits and vegetables come from a farm. There are many small farms in Vermont that grow a variety of food. Every vegetable grows differently, so there is a lot to learn from every visit.

ESSENTIAL QUESTION:

What parts of plants do we eat?

OBJECTIVES:

1. Students will learn about the basic processes involved in growing vegetables.
2. Students will examine a variety of vegetable plants to learn about the six basic parts of a plant.
3. Students will taste six different edible plant parts.

PRE-TRIP ACTIVITIES:

- What is a vegetable?
- How do vegetables grow?
- Basic plant structure and vocabulary

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Farm Tour & Scavenger Hunt
- Blindfolded Garden Walk
- Plant Observation
- Farm Work Project: harvest, wash, weigh, bunch
- Plant Part Harvest & Taste Test
- Filler: Book: *Tops & Bottoms*
- Wrap Up

POST-TRIP ACTIVITIES:

- Write thank you letter to farmer
- Cooking with vegetables
- Compare and contrast a cucumber and an eggplant

VEGETABLE

MEET THE FARMER *10 minutes*

Greeting: Have students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about themselves and their farm.

Today's Plan: Tell the students what they will be doing today. For example, "we will be investigating how vegetables grow and learning about the different plant parts that we eat. We will also have an opportunity to taste some of the vegetables grown here."

FARM TOUR & SCAVENGER HUNT

30 minutes

As the farmer gives a tour of the farm, kids will learn about the basic infrastructure and important components and processes of vegetable farming.

1. Before starting the tour give each student a picture of something they might find on the farm. Ask them to be on the lookout for their item and to indicate to the group when they have found it. Ask the farmer to talk briefly about the importance of each item as they are discovered.

Scavenger Hunt Items could include:

- Fertilizer/compost
- Seedlings
- Water
- Sun
- Seeds
- Insects
- Weeds
- Soil
- Hand tools
- Tractor
- Irrigation
- Trellising
- Flowers
- Vegetables
- Greenhouse

BLINDFOLDED GARDEN WALK

20 minutes

Students familiarize themselves with the different smells and textures in a garden and get to know one plant using their sense of touch and smell.

1. Split the group into pairs and designate one partner as the guide and one to be blindfolded. Before starting, be sure to talk to the students about how to safely walk in the garden paths and touch-plants.
2. The guide leads the blindfolded partner to an area in the garden by holding one hand and placing the other on her shoulder. Make sure they feel safe and avoid stepping on plants or other obstacles along the way.
3. Once at the chosen spot, the guide places the hands of the blindfolded partner on the plant they want them to observe. The blindfolded partner explores the plants and the surrounding area with their hands, nose, and ears. Encourage students to squeeze the plant to smells its aroma and to feel for other things in the area: soil texture, row size, plant spacing, etc.
4. When the blindfolded person is ready, the guide leads the partner back to the starting point. When the blindfolded person is back, the guide may remove the blindfold. Now, can that person find the same plant?
5. Switch roles, and do it all again.
6. Gather back together as a whole group and share observations. Which plants smell similar? Do they look similar? What helped you find your plant? Describe the texture of your plant.
7. With the farmer's help, identify what types of plants the students were observing.

Reflect: Do all of the different vegetable plants have similar characteristics?

PLANT OBSERVATION

30 minutes

Students will observe and diagram one type of vegetable plant.

1. In the same partner groups, ask the students to choose one of the plants they have just observed blindfolded, explaining that they will now conduct a closer investigation of this plant to get to know it even better and to create a detailed diagram of it.
2. Pass out clipboards with paper, pencils, rulers or measuring tapes, and magnifying glasses.
3. Before dispersing, review the basic structure of a plant, going over the 6 plant parts and their basic functions:
 - **Root:** Usually forms below the ground, acts as an anchor for plant, absorbs water and nutrients, and provides physical support and food storage.
 - **Stem:** Provides support for the buds and leaves, gives the plant its form. Helps transfer water, minerals, gases, and sugars throughout the plant.
 - **Leaf:** part of the plant involved in photosynthesis.
 - **Flower:** The structure that contains the organs for reproduction; pollination also occurs here.
 - **Fruit:** Area surrounding the newly developed seed
 - **Seed:** After pollination occurs, fertilized ovules grow and swell to form seeds. The seed contains an embryo, an endosperm, and a seed coat.
4. Students will spend some time observing and diagramming their plant. Encourage them to measure their plant and its different parts, and to include and label their diagrams with as many details as possible (parts, measurements, colors, other organisms around the plant, space between plants, etc.)

VEGETABLE

5. Gather back together as a group and have the pairs present their diagrams to the group.
6. At this point identify which part of their plant is the edible portion.

Reflect: What parts of plants do we eat? Do we eat the same part of each plant? Do we eat more than one part of some plants? Do the plants with the same edible parts have similar characteristics?

FARM WORK PROJECT

30 minutes

Students will help the farmer with a work project on the farm: harvesting, weeding, mulching, transplanting, planting, etc. Establish with the farmer ahead of time what kind of work needs to be done that day. Ask kids to think about the following questions while participating in the work:

1. What does a farmer need to provide for the vegetable plants to grow and thrive and produce food for us to eat?
2. What resources used on the farm are man-made and what resources are natural?
3. What could get in the way of growing healthy, productive crops?
4. What vegetables are easier or harder to grow? Why?

PLANT PART HARVEST & TASTE TEST

40 minutes

Students will harvest and taste a variety of plant parts. Identify with the farmer ahead of time which plants can be harvested for a taste test, attempting to include at least one vegetable representing each of the six plant parts (root, stem, leaf, flower, fruit, seed).

1. Divide the class into harvest groups (2-4 kids per group) and assign them one or more vegetables to collect.
2. Give each group a map of where to locate the vegetable and instructions for how to harvest it. Provide the groups with the appropriate harvest tools and containers to collect their items and be specific about how much they should harvest.
3. Have each group harvest with the help of an adult.
4. Meet back together to wash the vegetables.
5. Cut up the different vegetables and taste one plant part category at a time!

Reflect: What plant parts do you enjoy eating the most?

FILLER:

BOOK: *Tops & Bottoms*
by Janet Stevens

Learn about the different plant parts we grow and eat through this tale of the manipulative relationship between a wealthy bear and his smart and tricky neighbors, a family of rabbits.

Listening Questions: What are some "tops" you eat? "Bottoms"? What parts of the plants are those?

WRAP UP

Reflect:

We had a great time here at the vegetable farm!

What was your favorite plant part to eat?

WIND POWER, ALTERNATIVE ENERGY

MATERIALS:

Paper and pencils for the group
Clipboards
Pieces for Where Did It Go? activity
Generation slips of paper
Items to make kites
Calculators

Since the beginning of time, renewable resources have provided warmth, movement, light, and energy, from early sailing ships to high production wind farms. The integration of renewable energy poses real opportunities and challenges for today and for our future. Students will go behind the scenes to learn how a farm utilizes wind power and discover some interesting ways Vermonters are using land to redefine agriculture in the Northeast Kingdom.

ESSENTIAL QUESTION:

How is wind power harvested and how can we use it?

OBJECTIVES:

1. Students will learn how wind energy is converted into electrical energy through the technology of wind turbines.
2. Students will explore the costs and benefits of using wind energy.

PRE-TRIP ACTIVITIES:

- Discover where energy comes from
- Discuss the effects different kinds of energy have on the environment
- Research types of alternative energy
- Learn about wind and wind patterns

FIELD TRIP ACTIVITIES:

- Meet the Farmer
- Wind Turbine/Windmill Tour
- Where Did It Go?
- Riding the Wind with Math
- Filler: Be An Electrical Conduit
- Wrap Up

POST-TRIP ACTIVITIES:

- Conduct a school energy audit
- Write thank-you letter to farmer
- Construct a small-scale windmill

WIND POWER

MEET THE FARMER 10 minutes

Greeting: Have students stand in a circle and introduce themselves to the farmer. Ask the farmer to briefly say something about their farm.

Today's Plan: Tell the students what they will be doing today: "We will be learning about wind power, how it is harvested, and how it can be used."

WIND TURBINE/WINDMILL TOUR

45 minutes

Students will get a tour of the wind energy building and have the opportunity to ask questions regarding the wind turbine and the amount of power it is able to generate.

1. Have the farmer give a tour of the wind energy facilities that will answer the question: How does a wind turbine work?
2. A few great places to point out: parts of the wind turbine and their function, where the kW are measured, and the generator.
3. While giving the tour, the farmer should point out topography of his land and the placement of the turbine.
4. At the end of the tour, have the students sit in a circle around the turbine. Hand out paper and pencils. Students will draw the turbine they just toured, include labeling parts of the turbine (generator, blades, and tower), height, and other dimensions that they are interested in.
5. *Extra information for educator: With good wind a 1,650 kW turbine could power 400-500 homes, a 500 kW turbine could power 100-150 homes, and a 10 kW turbine could power 1 home.

Reflect: Can you estimate the number of houses this turbine can sustain? What about a farm of turbines? What are the best locations for turbines?

WHERE DID IT GO? 15 minutes

Students will learn the difference between renewable and nonrenewable resources. *(Adapted from Landward Institute with Northern Arizona University.)*

This activity should be prefaced with a discussion about renewable and nonrenewable resources. Renewable resources will never run out and can be used again and again. Examples are: biomass, hydroelectric, geothermal, solar, tidal, wave, and wind. Nonrenewable energy cannot be replaced or is replaced very slowly by natural processes.

Examples are: coal, oil, nuclear, natural gas, and tar sands, and oil shale.

Renewable Resources

1. Divide the class into groups of groups of four.
2. Each group will need a small paper bag full of 16 pieces. Pieces could be popcorn, bean seeds, erasers, rocks, etc. but need to be all the same. Each group should also have a pencil and paper.
3. The educator should have a paper bag full of leftover pieces to replenish the used resources.
4. Each team begins with 16 pieces. Each person must take at least one piece per round to survive and may take as many as they like.
5. One student records the number of pieces each student takes per round and the number of pieces remaining for the team.
6. After round 1, the resource is then renewed by half. (If there are 8 pieces remaining after round 1, the educator will add 4 more pieces to the bag for round 2.)
7. Six rounds are played in this manner. The object of the game is to have the most pieces per team member after the final round. At the end of the game, have students return all pieces to the educator.

Reflect: What are some different strategies teams used? How did group size and resources function together? What are renewable resources we could utilize for the school? For your home?

Nonrenewable Resources

1. Students each pick up a slip of paper from a bag. Each slip will read one of the following: 1st generation, 2nd generation, 3rd generation, 4th generation. When creating these slips, the numbers should gradually get larger, i.e. 4 1st generation slips, 6 2nd generation slips, 9 3rd generation slips, and 14 4th generation slips.
2. After each student has a slip of paper, the educator should lead a brief discussion of what it means when one generation finds a resource and how future generations are affected by this.
3. The educator should have a paper bag with all the pieces from the previous activity.
4. 1st generation students will go up to the bag and take as many pieces as they want. 2nd generation students should do the same, followed by 3rd and 4th generations.

Reflect: How did you act in using the resources? Did any waste occur (drop on the ground)? When taking resources, did you think about the generations before you and after you? Did the 4th generations experience less quality resources?

Reflect: These questions are a reflection on the activity as a whole: Under what circumstances would a renewable resource not be renewable? What could be some effects of population growth, natural disasters, disease, and advanced technology systems on resource availability? What are some advantages and disadvantages of using renewable resources in place of non-renewable resources?

WIND POWER

RIDING THE WIND WITH MATH

60-90 minutes

Students have the opportunity to create their own kite, fly it, and make decisions about wind power based upon the success of their kite. For more information please visit the following website for more information: <http://learn.kidwind.org/teach>.

1. Tell the students that they must construct a kite using items found in the educator tub. They may work on their own or in partners. The goal is to design a kite that will successfully use the wind to fly.
2. Items in the bin can be: sheets of paper (computer, cardboard, construction, etc.), paperclips, tape, thin dowel pieces or new, unsharpened pencils, stapler, hole punch, string, plastic bags, kite string, sticks of wood, rulers. Include other materials as the educator deems necessary.
3. Give students 20 minutes to design and create their kite.
4. After designing time is finished, give them another 15 minutes to try to fly their kites. If a kite is not flying, allow them to fix it or find a different location.
5. Five forces affecting your kite:
 - a. Wind – the movement of air particles. Wind happens because earth's surface is not heated equally.
 - b. Gravity – The force that pulls a kite straight down to earth.
 - c. Drag – A kite's frictional resistance to the wind.
 - d. Lift – The force that pushes the kite up into the air. The kite needs to be angled so that air passing over the top of the kite is flowing more quickly than air passing under the kite.
 - e. Tension – The force that pulls the kite along the string to where you are standing. Can be straight down or at an angle.
6. Gather students together after flying kites.

7. Ask students reflection questions before moving on to the math portion.

Reflect: At what elevation did you find it easiest to fly your kite? What was difficult about flying your kite? What allowed it to fly? How are turbines built to effectively harvest wind power?

After flying kites, have students move into the math portion of the activity. The educator should obtain some of these numbers before the farm field trip. To determine the success of a wind turbine in producing power, use the following equation:

1. Calculation of the power of wind:

$$P = \frac{1}{2} \rho A V^3$$

- a. P is the power (watts)
- b. ρ is air density (about 1.225 kg/m³ at sea level)
- b. A is the swept area of the blades (m²)
 - i. swept area: $A = R^2$. Area of the circle swept by the rotor
- c. V is velocity of the wind (Because V is cubed in the equation, a small increase in V makes for an increase in power.)
 - i. 20% increase in wind speed means 73% more power

2. Sample problems for the power of wind:

- a. What is the swept area ($A = R^2$) of a wind turbine with 6 blades that are 45 meters long?
- b. What is the swept area of a wind turbine with a rotor diameter of 60 meters?
- c. If the wind is blowing at 10 meters/second, how much total power is in the wind hitting the wind turbine from question one (blades 45 meters long)? How much total power would it receive from the wind if it was blowing at 20 meters per second?
- d. The second wind turbine (60 meter diameter) is also at sea level, but it is in a windier place. How much total power would it receive from the wind if it was blowing at 20 meters per second?

3. Measuring height using shadows and similar triangles:

- a. Start by measuring the length of the shadow of the turbine, using a yardstick, from the base of the turbine to the end of the shadow.
- b. Next, measure the shadow cast by the yardstick.
- c. Since you know the height of the yardstick and the length of the two shadows, set up a similar ratio to find the height of the turbine:

$$\frac{\text{unknown height}}{\text{shadow A}} = \frac{\text{known height}}{\text{shadow B}}$$

- d. Solve for the unknown height:
unknown height = (known height/ shadow B) x shadow A

FILLER:

BE AN ELECTRICAL CONDUIT

This is a simple activity that will help students think about paths electricity can take.

1. Have the group gather together and hold hands, forming a large circle.
2. Everyone is acting as electrical conduits. Each person should pass on what they receive from the person before them.
3. The educator then sends an "electrical pulse" by lightly squeezing one person's hand. Once it returns, the instructor can send pulses in both directions.
4. If possible, choose two students to start a pulse at the same time.

Reflect: If the pulses were real, how long would it take to circle the group? Would the electricity keep going in circles or would it stop?

WRAP UP

Reflect:

We had a lot of fun designing kites today and learning about wind power! What are some alternative ways you could power your home?

APPENDIX

SCHEDULING FORM

TEACHER: _____ FARM: _____

CONTACT INFO

School: _____

Grade: _____

Phone: _____

Email: _____

Best time to contact: _____

Special Needs: _____

TRIP DATE AND TIME

Farm Name: _____

Farm Type: _____

Contact Name: _____

Phone: _____

Email: _____

Best time to contact: _____

TRIP DETAILS

Number of students: _____

Number of adults: _____

Date: _____

"Rain" Date (if needed): _____

Field Trip Time: _____

Depart: _____

Return: _____

How will you be traveling (car, bus?)

Who will be scheduling the bus?

Will you be bringing lunch?

This farm field trip is an excellent opportunity to connect key classroom concepts such as history, arts, and literature, as well as math and science. Which concepts would you like to connect to your farm visit?

What standards do you hope to meet on this trip? *(For example: Investigation; Problem Solving Process; Historical Connection.)*

Using the list of farm activities, which would you most like to incorporate into your visit?

Please include a question(s) from the class for the farmer to think about before the field trip:

Other details to note?

FARM CONFIRMATION

Here are the confirmed details for the upcoming field trip to your farm! We hope that the students will find their visit to a local farm a unique and exciting experience. If you have any further questions, please do not hesitate to contact the school.

Date: _____

School: _____

Teacher: _____

Grade: _____

Number of students: _____

Number of adults: _____

Contact number: _____

Arrival at farm: _____

Departure from farm: _____

Topics covered:

Activities:

Cancellation statement: If you choose to cancel the field trip please contact the teacher listed above as soon as possible. If you cannot reach the teacher, please contact the school office.

TEACHER CONFIRMATION

Here are the confirmed details of your upcoming Farm Field Trip! We hope that you will find your visit to a local farm a unique and exciting experience. If you have any further questions, please do not hesitate to contact the farmer.

Statement for Chaperones: Thank you for volunteering your time on this special trip to the farm. We have designed this trip to be fun and engaging for both the students and for you. Please keep in mind that this is a new experience for many of the students, and allow them to investigate and discover on their own. Your involvement is vital to the success of the field trip and we hope you enjoy your visit.

Appropriate Attire: The majority of the visit will take place outdoors. We encourage students and staff to wear appropriate footwear that can get muddy. If this trip is taking place during the cooler months, remember to dress in layers and bring hats and gloves.

Cancellation statement: If you choose to cancel the field trip please contact the host farmer as soon as possible.

Date: _____

School: _____

Teacher: _____

Grade: _____

Email: _____

Number of students: _____

Number of adults: _____

Contact number: _____

Farm: _____

Farm address: _____

Contact: _____

Contact number: _____

Directions: _____

Depart from school: _____

Arrive at farm: _____

Depart from farm: _____

Arrive at school: _____

Lunch plans: _____

Topics covered:

Activities:

POST-TRIP SURVEY FOR FARMS

THANK YOU for hosting a farm field trip! Please take a moment to let us know what the visit was like for you, your farm, and your staff. Your comments are important for the success of future farm field trips.

Farm Name: _____

School Name: _____

Date of Field Trip: _____

Date Completed: _____

What was the highlight for you as the field trip host?

How can this farm field trip be improved?

Was the group size manageable?

Was the time allowed for the visit reasonable?

Was the number of adult supervisors sufficient?

Were you adequately prepared for the visit? If no, what information would you find helpful for future farm field trips?

Would you be willing to host a farm field trip in the future?

Are you able to visit the classroom to continue the farm to school connection? If so, what time of year is most convenient for you?

Other Comments:

POST-TRIP SURVEY FOR TEACHERS

THANK YOU for taking your class on a farm field trip! Please take a moment to let us know what the visit was like for you and your students. Your comments are important for the success of future farm field trips.

Farm Name: _____

School Name: _____

Teacher Name: *(optional)*

Date of Field Trip: _____

Do you feel the students enjoyed the farm field trip? Yes / No

Do you feel the farm field trip was educational? Yes / No

Do you feel the trip was engaging for the students? Yes / No

What was the highlight of the farm field trip for your class?

Were you able to connect this farm field trip with the standards for your grade?
If so, which standards?

Which follow-up activities do you plan on doing with your class?

How do you think this trip can be improved?

Is there any additional information that would help you to prepare for this trip in the future?

Other comments or suggestions:

Date Completed: _____