1. **Name:** Trishalana Sunshine Shanks and Jennifer Bacon

2. **Title of Lesson:** Let’s Raise a Barn

3. **Purpose:** The purpose of this lesson is to spark students’ interest in learning about agriculture literacy and practices through a STEM activity.

4. **Grade Levels:** 2nd – 8th Grade (with modifications)

5. **Time length of lesson:** 2 sessions, 50 minutes each session (extra sessions needed for

 extensions)

6. **Objectives of the lesson:** Students will engage in critical thinking skills to build a hay barn. During the process, students will use a ruler to measure their barn to meet certain requirements and to calculate the volume of their barn.

7. **Common Core Standards Addressed:**

* Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
* Ask and answer questions about key details in a text.
* Measure and estimate lengths in standard units: Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. (Grade 2,3)
* Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. (Grade 4)
* Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. (Grade 5)

8. **National Agriculture Literacy Outcomes:**

Theme 4, understanding the science, engineering, technology, and mathematics of agriculture, food, and natural resources is crucial for the future of all humanity.

9. **Materials list:**

* 20 wooden craft sticks
* 2 pieces of 9 X 12 inch construction paper
* Tape
* Ruler
* Scissors
* Calculator
* Paper or notebook for each student
* Pencils
* Agriculture related books and/or videos about barns –
	+ Tuttle’s Red Barn by Richard Michelson (book)
	+ YouTube Videos: <https://www.youtube.com/watch?time_continue=2&v=rCQZENqhO_w> <https://www.youtube.com/watch?time_continue=49&v=rAw7Fs_IAW4>

10. **Vocabulary or keywords**:

**natural resource:** something found in nature that is used by people as a need, such as food, or can be used by humans because it is useful

**agriculture:** the growing of crops for human and animal consumption and the raising/management of livestock and other natural resources for human consumption and use

**farmer:** a person who grows and manages the land to grow crops

**rancher:** a person who raises and cares for livestock

**hay:** grass that has been cut and dried as a feed source for livestock

**barn:** a farm building used for storage or housing livestock

**livestock:** farm animals

11. **Instructor procedure**

**Activity One (1- 50 minute session):**

Read the story, *Tuttle’s Red Barn,* by Richard Mickelson. Discuss with students that barns serve many purposes for farmers. In this story, *Tuttle’s Red Barn*, Richard Mickelson, the author, takes readers on a journey through time of how one family grew their farm with the changing times and how they adapted the function of their barn to their farming needs. Then show students a video(s) from YouTube of how barns can be used. (The URLs are listed in materials section.) Discuss with students the function of different types of barns.

Using a comparison and contrast chart, such as a Venn Diagram, have students choose two types of barns and describe how they are alike and how they are different in their functions.

(poultry barns, dairy barns, hog barns, stables, lambing barns, storage barns)

**Activity Two (1 – 50 minute sessions):**

Explain the following to the students:

They will construct a model of a hay barn using materials the teacher provides. Tell the students you will have them work in groups or with a partner (teacher discretion) to build a barn for hay storage. They are to maximize the barn space to fit as much hay in it as possible. Just like farmers are limited in the amount of money they can spend on building materials to build a barn, you will be limited on how much materials you can use. Listed below are some questions to ask to encourage critical thinking before and/or after students’ barns are built.

**Questions that promote critical thinking:**

How many sides does your barn have?

Will you bring the hay through a side or end of the barn?

Where is the best location for a barn?

What type and/or size of bales will you put in your barn?

How high will you stack your bales?

What type of materials would be used to build a real life hay barn?

Can your barn withstand strong winds, ice , and snow?

When students’ barns are built, have older students measure the interior volume (length X width X height) of their barn. (Students can do this along the way to try build a barn with the greatest volume possible.) The teacher will see which group built the barn with the most interior volume. To add a challenge, you can inform students that their barn will be used for 4 ft. x 4 ft. big round bales of hay, and the tractor can only stack 2 bales high. Therefore, how can the barn be built to hold as many big round bales as possible.

Note: 1 inch = 1 foot for our barn building

12. **Additional resources which enhance the lesson**

* http://extension.missouri.edu/webster/hay\_barns.aspx
* As a reference:<http://writeforag.weebly.com/>

13. **Essential Questions/Assessment**

* What is the function of a barn?
* What are types of barns are there?
* What are the similarities and differences of barns?
* Why are barns important?

14. **Extensions**

**Math:**

How many 4 ft. x 4 ft. bales can fit in the barn?

Young students can stack manipulatives such as thread spools or film canisters in their barn. They can count to see how many will fit.

Older students can find their barn volume, length x width x height. Then they find bale volume, which is volume of a cylinder (h x pi (3.14) x r squared), if using big round bales. They would then take the barn volume divided by the bale volume to get an approximate amount of hay that will fit in the barn.

Older students could research the amount of needed materials and calculate the cost to build a hay barn.

**Science:**

Scientific method can be used to investigate ventilation, and temperature control.

Diseases and animal health care can be investigated.

Plant science can be done with students growing the grasses used for hay. Older students could use the science method to investigate effects of temperature, and moisture, as well as types and amounts of fertilizer. Younger students can explore what grasses need to grow.

Don't forget issues such as run off and waste management.