Inspire Day Lessons Descriptions

One Room Schoolhouse
Recreating spelling, recitation, and penmanship lessons as Norman Borlaug might have experienced when he was a boy in the same school building

Garden
Planting heirloom vegetable varieties

It Costs What?
A comparative economics lesson explores patterns of how the cost of staple products have changed over the last century.

Social Play in the Day
Homemade toys of the 1920's

Borlaug's Five Goals
Modeling Borlaug's life strategies in a collaborative problem-solving exercise

From Grain to Lefse
Participants grind wheat grains, creating flour for the dough that is combined with potatoes to make a Norwegian immigrant food commonly eaten in the region.

Wheat Germination
An exploration of sprouted wheat seed characteristics and a self-designed take-home investigation of factors influencing germination rates

What is Wheat?
An exploration of wheat in common processed foods

Population Considerations
A running game simulates population dynamics generating data that is used to graph dramatic population growth and crashes.

Is it Fair? Food, Energy, and Fairness
Comparing and contrasting global distribution of food and energy resources

Simple Machines- Power On!
Experience how the advent of electricity changed the amount of effort required to accomplish tasks required for construction.

Solar Powered Vehicle Construction and Testing
Applying renewable energy technology in designing transportation solutions

Model Wind Generators
Applying renewable energy technology in designing energy solutions

Watersheds
Modeling the impact of land-use practices on water quality using the Enviroscape simulator

Water Quality
Identifying benthic macro-invertebrates and testing Oxygen, pH, nitrate and phosphate levels in the farm creek

From Prairies and Forests to Farmland
Identifying changes in biodiversity as human intervention impacts the local ecosystem.

Topic: Seed Germination

Grade Level: Upper Elementary

Goal/Objectives:

1.0 To understand conditions that might influence effective germination in wheat seeds.

1.1 identify and sequence the growing process for wheat plants

1.2 discover what influences the germination process in wheat

1.3 compare/contrast germination in soil vs. damp paper towels

2.0 To understand how data collection and data analysis help scientists.

2.1 document changes in dependent variables for germination

2.2 record % of germination for 10 seeds

(lower elementary could use 100 seeds to develop concept of %)

3.0 To understand some of the challenges Dr. Borlaug faced in his research.

3.1 list challenges with wheat production that influenced Dr. Borlaug's research decisions

3.2 compare/contrast physical challenges for Dr. Borlaug that are less evident through today's technology

3.3 analyze criticism of Dr. Borlaug's work

***Next Generation Science Standards*:**

5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.

[Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]

3-LS3

Heredity: Inheritance and Variation of Traits

3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

[Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.]

Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted…]

Lesson Materials List:

Wheat "bunch" that is sprouted (prepared before class day)

Wheat seeds

Plastic baggies

Gallon bags

Paper towels

Easel

Printed directions for extension lessons to give teachers

Table

Sharpies

Water and water bucket

4 sets of the 9 stages of wheat growth process

1 large poster of 9 stages of wheat growth process for easel

Easel

Wheat Growth Process – KEY for WS

Read the sentences below. Number the steps in order from one to nine to retell

what happens to wheat, from seed to harvest (see worksheet).

1. Before planting, the farmer prepares the soil.
2. The farmer puts the seed in the ground, using a machine called a grain drill.
3. A shoot grows up through the soil.
4. The plant grows tall and develops green leaves.
5. The plant continues to grow until there is a hard freeze.
6. The plant rests through the winter months.
7. In the spring, the plant grows quickly.
8. The full-grown plant turns from green to tan to yellow to a golden color.
9. The wheat is harvested.

5-E Learning Cycle—(Bybee)

When group arrives, divide group into two (2) separate groups by numbering off 1,2,1,2,… so that numbers are smaller in the group. One group will order steps and then switch to germination station.

ENGAGE:

- Has anyone here ever planted gardens?
- What foods have you eaten that has been made from wheat?
- What does wheat look like when it is planted in the field?
- Can you think of any similar plants?
- Where in the world is wheat produced and how is this connected to Dr. Borlaug's work as a scientist who helped many people in the world?
- Make a connection to Norman Borlaug
    - He grew up on an Iowa farm. He was very interested in the plant growth process at a young age. He went on to grown wheat to help feed millions of people.

EXPLORATION:

- Share wheat plant with students and pass around for students to observe.
- Discuss things they observe?
- Share facts about spring vs. winter wheat.
- Students observe sprouted wheat (use senses to observe plants)
- Share seeds and have students count out 10 seeds to sprout

EXPLANATION:

- Ask students to discuss what they think wheat seeds need to sprout with a partner
- Share ideas
- Have children observe sprouted wheat again and ask if they still agree with their ideas
- Explain sprouting activity to begin today with paper towels, water, plastic bag, and water
- Have each child place seeds in dampened towel and then in plastic bag
- Make predictions on sprouting and things that might effect sprouting

ELABORATION:

- Children may take seeds back to class and fill out data sheet by making predictions and changing variables
- Children will record the percentage of seeds that sprouted each day under varying conditions
- Discuss the sequence of winter wheat production from planting to harvest
- Share a chart and have children "replay" the process by "actions" for each stage (The leader will be the "combine" in the final harvesting stage.)

EVALUATION:

- Children will receive statements on the growth cycle and need to place statements in the correct sequence

Extension Questions

Planting:

● What would happen if…?

  ○ If you have animals where you have planted seeds?

  ○ If you plant too many seeds? Does it matter?

  (Other questions children might add.)

Evaluation:

Things to listen for:

Are students getting 7 or 8 of the steps in the correct order?

Are students working together when discussing what order to put the Wheat Growth Process steps?

Things to look for:

Are students planting seeds in the way described?

Are students engaging in wheat grown process activity?

Can students place growth cycle in correct order?

Do students know the impact of Dr. Borlaug's research?

---------- **cut here** ----------

Lesson Ideas for Wheat Germination when students return to school:

Discuss with the classroom teachers about what children can do with the seeds after lesson.

Print out a sheet of directions discussing how teachers could use the wheat seed plants for investigative science lessons and or math lessons (% plants grown)

- Comparing growth in different areas of the classroom

Pick a couple different places in the classroom to put the wheat baggies. Ask students to put their baggie in one of those spots in the classroom. Students can predict what they think will happen to their seeds.

Predict:
How long do you think it will take for their seeds to grow?
How many plants do you think will start growing?

Wait 2 weeks or so until the wheat seeds start to germinate (green shoots are showing). Ask students to look at their plants. Record the percentage of the plants that have started to grow. Share data with the class.

Discuss as a class how the plant growth progress is. How many have grown? How tall are they? What do they look like?

Ask students why the seeds didn't all grow the same. Investigate why the seeds may have grown differently in one location compared to another location.

Students take plants home.

Wheat Germination Chart

Independent Variable (# of Wheat Seeds)	Dependent Variable (Amount of…)	# of Days	# of Sprouts	% Germinated (Sprouts × 10)
10	*Moisture*			
10	*Sunlight*			
10	*Soil*			

WINTER WHEAT GROWTH CYCLE

(The statements are in correct order. Cut statements apart and students need to assemble them in the correct order. See lesson for numbered order.)

Before planting, the farmer prepares the soil.

The farmer puts the seed in the ground, using a machine called a grain drill.

A shoot grows up through the soil.

The plant grows tall and develops green leaves.

The plant continues to grow until there is a hard freeze.

The plant rests through the winter months.

In the spring, the plant grows quickly.

The full-grown plant turns from green to tan to yellow to a golden color.

The wheat is harvested.

Borlaug Inspire Day Schedule

Classes	Seed Germination	One-Room School	Garden/ Heirloom Seeds	Good, Energy, the World & Fairness	Fun on the Farm: Home-Made Recreation	Population Consideration "Oh Deer"	Grains & Food (Lefse)	Engineer-ing: Building Solar Cars	Borlaug's 5 Goals
9:30-10:00	Wilson	Basmon	Johanson	Forde	Whealer	Smith	Shraeder	Jeffers	Stakey
10:00-10:30	Stakey	Wilson	Basmon	Johanson	Forde	Whealer	Smith	Shraeder	Jeffers
10:30-11:00	Jeffers	Stakey	Wilson	Basmon	Johanson	Forde	Whealer	Smith	Shraeder
11:00-11:30	Shraeder	Jeffers	Stakey	Wilson	Basmon	Johanson	Forde	Whealer	Smith
11:30-12:00	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
12:00-12:30	Smith	Shraeder	Jeffers	Stakey	Wilson	Basmon	Johanson	Monteih	Whealer
12:30-1:00	N. Winn	Smith	Shraeder	Jeffers	Stakey	Wilson	Basmon	Johanson	Forde
1:00-1:30	Forde	Whealer	Smith	Shraeder	Jeffers	Stakey	Wilson	Basmon	Johanson
1:30-2:00	Johanson	Forde	Whealer	Smith	Shraeder	Jeffers	Stakey	Wilson	Basmon
				2:00-2:15 Closing 2:30- Buses Leave					