# Serious Cereal Science

**Grade Level(s)**

Middle School

**Estimated Time**

30 minutes

**Purpose**

Students will develop an appreciation for cereal grain production, processing and consumption.

**Materials**

- Links:

  Website with virtual resources: www.linncoag.com -2020/21 virtual learning drop down tab- January

  Instructional video https://www.youtube.com/watch?v=LOPR5cAd0fY

- Worksheets:

  Key to grain facts information board

  Where my cereal grows map

  Agronomy specialty facts card

  Grain facts information board with matching cards

- Other:

  Grain samples

**Vocabulary**

**Annual:** a plant that completes its life cycle in just one year or one season
**Cereal:** a plant from the grass family that produces grain that can be eaten
**Combine:** a machine that harvests and threshes grain
**Grain:** the edible seed or seedlike fruit of grasses that are cereals (such as wheat, corn, and rice); also, plant that produces grain
**Pseudocereal:** non-grasses that are used in the same way as cereals, such as quinoa, amaranth, and buckwheat
**Refined grain:** has some portion of the grain removed (generally the bran and germ) in order to improve qualities like texture, taste, or shelf life
**Whole grain:** contains all three edible parts (the endosperm, bran, and germ) in the same proportions as the harvested grain seed before it is processed

**Interest Approach – Engagement**

Ask students if they can tell you what the main ingredient in most breakfast cereals is. *(grain, such as wheat, corn, rice, etc.) Show them the samples and see if they can identify.*

**Background - Agricultural Connections**

Without the **grains** grown on American farms, the grocery store **cereal** shelves would be empty (as would other shelves). Consumers and business owners alike need farmers to produce the raw ingredients to fill factories, trucks, and stores, and to provide jobs along the way (graphic designers for packaging, engineers in processing, food scientists, etc.). In fact, the person who designs the box for Tony the Tiger's Frosted Flakes® owes his or her livelihood to the fact that someone grows corn. About one out of every eleven Americans (or 9%) rely on agriculture for employment. It's hard to imagine an empty cereal aisle at your favorite grocery store, and it's easy to forget that all of the cereals came from a farmer's field.

The grains that occupy the top of the ingredients lists on our cereal boxes are the seeds of grasses, and they have been an important part of the human diet for thousands of years. Around the world, early agriculture included the domestication and cultivation of grasses for the grains they produce. Wheat was domesticated in the Fertile Crescent of the Middle East, rice in the river valleys of ancient China, and corn in what is today central Mexico. Early agriculturalists in the Andes Mountains of South America did not domesticate grass for grain, but rather a broadleaf plant called quinoa (keen wah), which is more closely related to beets and spinach than to grasses. Quinoa produces seeds that can be cooked and eaten like grains, and is often grouped as a pseudocereal. Today, quinoa and other **pseudocereals** are growing in popularity due to their high nutrient content, their ability to grow in conditions not suited to true cereals, and rising demand for wheat-free grain alternatives. Quinoa even cooks up into a tasty, hot breakfast cereal.

Although they are all **annual** grains, wheat, corn, and rice require different growing conditions to produce a bountiful crop. Rice requires a consistently warm growing season and constantly moist soil. Rice fields are often flooded to prevent weed competition. Corn also grows best in areas that have hot summers, although it can tolerate much lower temperatures than rice. Corn needs fertile soils and regular rain or irrigation throughout the season. In contrast, wheat is a cool season crop that requires less water than rice or corn. Wheat grows during the cool, moist spring and matures best during a warm, dry summer. Quinoa is uniquely suited to growing at high altitudes and can tolerate poor soils. High summer temperatures will reduce yields. Over time, plant breeders working together with farmers and agronomists have vastly improved the productivity of these grains and the range of growing conditions in which they can thrive. Less work has been done to improve pseudocereals like quinoa, making this an area with great potential for future plant breeders and farmers as well as for engineers, food scientists, and others to develop methods for processing, utilizing, and marketing these new crops.

Most grains are harvested mechanically with a **combine** after the plants have begun to dry in the field. It is important for grains to be kept dry during harvest to prevent

sprouting. Grains grown on a commercial scale are then sent to a mill where they will be cleaned, ground, and further processed to produce a wide variety of products. All **whole grains** contain three basic parts: endosperm, germ, and bran. When grains are milled, these parts are often separated. Whole grain products contain all three of these components in their original proportions. White flour and white rice have had the germ and bran removed, which contain the majority of the vitamins, minerals, and antioxidants found in the grain. These refined grains tend to store longer and have a sweeter taste. They are often enriched to return some of the nutritional content that is lost in the refining process. Corn is the most processed grain. Corn-derived ingredients can be found in thousands of products ranging from snack foods to plastics. Many people are employed in the processing, quality control, distribution, and sales of grains.

Just as grains were foundational in the of advent agriculture thousands of years ago, they continue to play a central role in agriculture and food security today. Corn, rice, and wheat provide more than half of the calories consumed by people worldwide. The science of cereal science is serious business! Students interested in a career in cereal science are required to study basic science education: biology, mathematics, and physics. Further study in chemistry, food processing, engineering, microbiology, nutrition, milling, or plant science offers students a wide range of opportunities for careers in cereal processing, food science, foods and nutrition, organic chemistry, biochemistry, or agriculture. Education in the aforementioned field of cereal science may include two-year technical degrees, four-year bachelor of science degrees, or postgraduate degrees.

**Procedures**

1. Divide your students into groups of four.
2. Distribute to each group: one bag of each seed sample (corn, rice, quinoa, and wheat), one set of *Agronomy Specialist Fact Cards*, one set of *Grain Facts Matching Cards*, and one *Grain Facts Information Board*.
3. Once they've identified the seeds, instruct students to distribute one *Agronomy Specialist Fact Card* to each member of the group.
4. The fact cards will make each student an "agronomy specialist" in corn, rice, quinoa, or wheat. Each student should read his or her fact card carefully. Students may take notes or use transparency markers to highlight important information—after reading their cards, they should be able to act like specialists! Let students re-identify their seeds at this time if needed.
5. Students should mix up or shuffle the *Grain Facts Matching Cards*
6. Instruct students to take turns picking a card and trying to match the card to the appropriate place on the *Grain Facts Information Board*. If they do not know where to match the card, they should consult the group's specialist in the relevant crop. The specialist may respond from memory, read his or her fact card, or reference notes to help determine a match.
7. The activity is finished when the information board is complete. Teachers may wish to post the answer key at the end of the activity and allow students to self-check their answers.
8. Provide each group with a *Where My Cereal Grows Map* and four different color markers. Using their knowledge as specialists, students should place a colored dot in each of the major grain producing states. (Instructions are on the map.)

9. Optional: Access Utah Agriculture in the Classroom's *Careers in Agriculture* YouTube playlist. https://www.youtube.com/playlist?list=PL7B61381EE0438243&feature=mh_lolz
    - Before showing the videos, cue students to listen for information related to cereal science careers, required education, and working environments. You may want to write these cues on the board as reference.
    - Show the following videos to students: #1 Wheat Breeder, #20 Cereal Chemist, #34 Agronomist.
    - Ask students to Think, Pair, Share with a classmate regarding the career information requested in Step 1. Via a class discussion, make a list of careers, education, and working environments on the whiteboard.

**Organization Affiliation**

National Ag in the Classroom https://www.agclassroom.org/matrix/lesson/417/

**Agriculture Literacy Outcomes**

Science, Technology, Engineering & Math

- Identify science careers related to both producers and consumers of agricultural products (T4.6-8.g)

**Iowa/ Common Core Standards**

Career Ready Practices

- *CRP.10.1* Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

Agriculture, Food, and Natural Resources Cluster Skills

- *CS.05.02* Examine and choose career opportunities that are matched to personal skills, talents, and career goals in an AFNR pathway of interest.

Economics Standard 6: Specialization

- *Objective* Explain how they can benefit themselves and others by developing special skills and strengths.

CCSS.ELA-LITERACY.CCRA.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.