



## Welcome to Ag@School!

Class sets of this magazine, aimed primarily at the 4th grade level, are FREE to subscribing Washington teachers. Instructions for subscribing are on page 4. Back issues are available at [www.waic.net](http://www.waic.net).

This is the first of three issues for 2015-2016. Delivery of the next two issues will be in January and April.

Produced by Washington Ag in the Classroom, Ag@School is designed to help teachers meet student educational goals as well as develop agricultural literacy.

This issue is designed to help students understand:

- The economic importance and diversity of Washington agriculture
- The importance of agriculture to their lives
- Washington geography and climate and how these influence agriculture
- The benefits of dams and how locks enable river transportation
- Genetic engineering is an important tool in improving crops and ag products
- Timothy hay is a major Kittitas County cash crop. According to a September 4, 2011 article in the Seattle Times, 90 percent of the timothy grown in the Kittitas Valley “will never be eaten by an American horse or cow. . . . Nearly all of the timothy from here is shipped by sea to Japan.
- Wheat grown in Washington is mostly exported

Reproducible activities in the teacher guide expand on concepts covered in the magazine. Included in the guide are vocabulary activities and post tests.

### Why Agricultural Literacy?

Agriculture is society’s lifeline and an integral part of our heritage. Unfortunately as our country moved from agrarian to urban, people lost contact with the main industry necessary for survival—food production. America’s largest industry has dropped from public discourse except for the occasional media splash. Yet we all eat, and it is important that we have an understanding of where our food is produced and who we depend upon to deliver it to our tables.

Less than 2% of the US population is involved in agriculture production (farming) yet 24 million American jobs are dependent upon it. Agriculture is more than working the land and tending the animals. This huge industry—production, processing, transportation, and marketing—generates billions of dollars each year. Agriculture is vital to national security, a stable economy, and the US trade balance.

### Augmented Reality

– A new feature for Ag@School

Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input such as sound, video, graphics or GPS data. (Wikipedia)

Ag@School has added this feature using the Aurasma platform. In this issue, and future issues, you will be able to scan a photo that will lead you to a video. That video will hopefully enhance understanding of a concept. For example, there will be a picture of the Ballard Locks, you scan the picture with your phone or tablet, and it will play a short video demonstration of how the locks work.

While you read you will see pictures with the Aurasma logo on them. Those are the pictures that have a video attached. Scan it using the Aurasma app (it’s free and

directions will be on page 5 of this teacher’s guide for how to use it) and enjoy the video.

You can also look online at <http://www.agclassroom.org/wa/> under publications for the online version of this magazine. With the online version you can simply click on the picture to show the videos to the class.

We hope you enjoy this new feature, it’s a work in progress but we think that it will be a great way to make connections to this magazine and to agricultural information.

## GLE, EALR & CCSS Connections

### Science:

SYSC, APPA, APPG

### Math:

CCSS Math 4.MD.A.1

### Health & Fitness:

1.5.1 and 1.5.2 pages 3,7 TG page 6

### Social Studies:

EALR 2.2.1, 2.2.2, 2.4.1, and 3.1.2

### Reading:

CSS ELA RI.4.7, RI 4.1

### Writing:

The post test is designed to help prepare students to write. The prompts include the four modes of writing: expository, narrative, descriptive and persuasive.

## Cover – Food Needed for Life

In the US, we do indeed have the least expensive food. We spend just 10% of our disposable income on food; 51% for food eaten at home, and 49% for food eaten away from home. In comparison other countries spend much more: Italy 14%, China 33%, Indonesia 43%, and Pakistan 46%. (source: USDA-ERS)

### Discussion starters:

1. Which of the crops or products around the edges of the cover have you seen growing? What crops and animals are raised where you live?
2. How does your county rank in ag value and food processing value? Go to the Washington Dept. of Ag website to download useful maps for the answers: [www.agr.wa.gov/AboutWSDA/FoodCropMaps.htm](http://www.agr.wa.gov/AboutWSDA/FoodCropMaps.htm) Teachers might also want to view the WSDA video “Our Farms to Your Table”.

## Grant Opportunity

The Washington Ag in the Classroom organization is pleased to offer a grant (up to \$500) to groups or individuals sponsoring programs or projects that promote agricultural literacy. The proposed project must be targeted to young people from 5-18 years of age and should enhance student knowledge of the contribution made by agriculture. The funds will be available to any school-aged students, teachers, and others in the community who are involved with agriculture.

Visit our website,

<http://www.agclassroom.org/wa>  
for more information and to apply.

## Page 2 – Ag is Science & Technology

Agriculture is responsible for the food we eat. Food comes from farms; it doesn't just magically appear in grocery stores or restaurants. Farmers and ranchers depend on a wide variety of ag-related careers. Have students brainstorm jobs that are needed to bring food to their tables. Have them research related ag careers like agronomist, entomologist, mechanic, irrigation manager, satellite guidance technician, or food photographer.

### Think

If we had no farmers, how would your life be different? Would your parents have the same jobs as today? Would you have different chores? If we didn't have semi-trucks would your diet be the same? Would the foods you eat change with the seasons?

### What is a GMO?

Creating a GMO can be simplified into 5 steps:

1. Identify the gene that codes for the protein of interest e.g. insulin
2. Remove gene from the donor e.g. human cell
3. Insert gene into a host e.g. a bacterium
4. Grow the altered bacteria on a large scale to make the protein product
5. Isolate the protein

Genetic modification involves the mutation, insertion, or deletion of genes, but not all genetic modification is considered GE or GMO. Although by definition we do not have GE wheat, we do have a variety, named "Clearfield" that will tolerate the herbicide Imazamox (brand name Beyond).

Clearfield wheat is non-GMO, unlike Roundup-resistant corn and soy. This genetic variant was created by a process called chemical mutagenesis. Scientists exposed wheat seeds to the chemical, sodium azide, to induce mutations.

In addition to chemical mutagenesis, gamma and x-ray radiation are also used on seeds and plant embryos to induce mutations. This all falls under the umbrella of "traditional breeding methods" and "hybridization", and are considered non-GMO

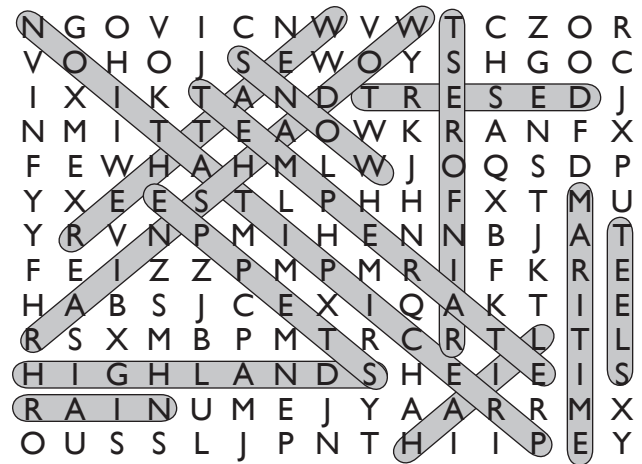
## Page 3 – Climate

### Discussion starters:

1. Why are different crops and animals raised in different regions of Washington? (They all have unique requirements for climate, rainfall, terrain, and soil to thrive)

2. What is meant by a "rain shadow"? (as clouds rise they lose moisture causing a dry region east of the Cascades) How does it affect the types of crops grown east of the Cascades? (With irrigation, anything can be grown, without irrigation farmers are limited to grain, grass seed, legumes, and some oil seed crops) Using the precipitation map, have students find rain shadow areas caused by the Olympic Mountains. Rain shadow video can be found at: <http://youtu.be/ez99nyfSHCk>
3. Track the fruit growing areas in Washington. They follow the banks of major rivers and lakes and the Columbia Basin Irrigation Project. There is enough water in these areas to make "micro-climates" that are warmer in the winter and cooler in the summer.

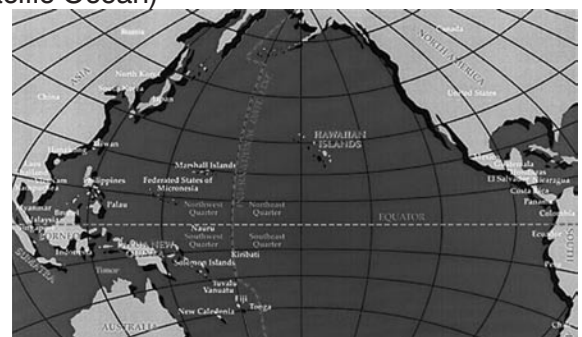
### Climate Word Search



## Page 4/5 – Grown in Washington

### Discussion starters:

1. What geographical features make WA such a diversified agricultural state? (Next to the Pacific Ocean; deep-water ports in Puget Sound; Columbia River for navigation, irrigation and power generation; Cascades split the state; volcanoes have provided the rich ash component of our soils; elevation goes from sea level to the top of Mt. Ranier)
2. Discuss individual growing regions and what factors make each an ideal place to grow specific crops or products (have students refer to the boxes on pages 4-5)
3. Why is a location on the Pacific Rim so important? (Closer to trading partners, especially around the Pacific Ocean)



## Page 6 – Rivers, Dams and Locks

Remind students that **technology involves changing the natural world to meet human needs or wants**. Our rivers are excellent examples of this. With our system of dams and locks, we provide water for irrigation, electricity production, recreation, cities and industry. We have flood control, transportation, and still provide for the needs of salmon.

Discuss how engineers found solutions to many problems to better serve our citizens and our economy. This in turn has improved the quality and quantity of crops we can raise.

Ballard Lock video can be found at <http://youtu.be/CY-y4lxSE88>

### **Background:**

1. Rock Island dam was the first large dam on the Columbia (1933). Bonneville Dam was second, built in 1938 for electricity generation. Grand Coulee was authorized as one of the many projects to put men back to work after the depression and was built to supply irrigation water for the Columbia Basin Project, using the sale of electricity generated by the dam to pay for the construction of the dam and the irrigation delivery system. In 1948 the Snake and Columbia Rivers crested simultaneously and created a flood that wiped out a section of Portland. River-use planners turned their attention to flood control (as well as navigation and power generation) as the remaining dams were completed on the two rivers.
2. Deep water ports are those capable of handling a fully laden Panamax ship. That is a ship that is the maximum size that can still fit through the Panama Canal. As the Panama Canal undergoes its current expansion, the list of ports will change. It is also important that we dredge the Columbia River Channel to keep the necessary depth clear for these huge ships to reach the largest Columbia ports. Other ports like Bellingham and Olympia are not equipped to handle Panamax ships. Bremerton is a large port for the US Navy.
3. Discuss the different ways people use and depend upon the Columbia and Snake Rivers (recreation, irrigation, water supply, power generation, flood control, wildlife habitat, transportation and commerce. Can the students think of more?)

### **Think & Discuss:**

Have students name three renewable energy sources. (hydro-electric power, wind power, and solar power). Why is hydroelectric energy the most reliable?



### **Discussion starters:**

Hydroelectric power is the most reliable because water behind the dams can be released through the generators at any time to supply electricity. If the sun is not shining or the wind is not blowing, solar and wind energy do not produce electricity. In fact, hydroelectric power is called upon to deliver electricity when these other power sources wane.

Hydro-electric power is possible on the Snake-Columbia System because of the drop in altitude between the source of these rivers and the ocean. A large river like the Mississippi is unable to use hydro-electric generators because it is relatively flat along its' length.

Fossil fuels, such as coal, oil, and natural gas are sources of energy derived from plants and animals that lived long ago. They are carbon based and release carbon dioxide into the atmosphere when burned. Our clean, renewable hydropower keeps the Northwest's carbon footprint at half that of the rest of the nation. Removal of the Snake River dams would add 5.4 million tons of carbon dioxide into the atmosphere each year. Replacing the energy capacity lost by Snake River dam removal would take at least three nuclear power plants or six coal-fired or fourteen natural gas-fired plants.

It would also take an additional 120,000 rail cars or more than 700,000 semi-trucks annually to move the cargo that now travels by barge on the Snake-Columbia river system. That traffic would stress already overtaxed bridges and highways.

Sensible solutions have been found and implemented to benefit fish and protect the value of the Columbia-Snake River System to Northwest families and businesses. Additional hydropower generation would seem to be logical.

More info at:

[www.nwriverpartners.org/issues-river-benefits](http://www.nwriverpartners.org/issues-river-benefits)

## **That's a Lot of Wheat**

10,072,800,00# divided by 2000#/ton  
= 5,036,400 tons



## **History of Timothy Grass Hay**

Timothy Hay, also known as Timothy Grass Hay, is a native grass from Europe. This rapid-growth perennial bunch grass is believed to have been introduced to North America through seeds brought by early settlers from Scandinavia in the 17th century. It was originally called Herd Grass after John Herd found it growing in the wild in New Hampshire in 1711 and began to promote it as a feed for cattle and horses.

Timothy Hay picked up its current name from Timothy Hanson, a Swedish immigrant, who began growing and promoting it as a superior fodder for horses in Baltimore, Maryland around 1720. Timothy Hanson is believed to be the first person to grow and sell Timothy seed commercially. Hansen found a good market for Timothy seed in several other colonies outside of Maryland.

Timothy Hay has excellent nutritional value for horses, especially when it is harvested when the seed heads are still young. Its protein level is lower than some other grasses, but is perfectly suited for thoroughbred race horses and pleasure horses. <http://www.timothygrasshay.net/history-of-timothy-grass-hay/>

### **Fast Facts for Hay in Washington**

Hay is the 6th most valuable commodity in the state  
Acres in WA by county: 30,000 in Kittitas, 35,000 in Columbia Basin

Per Acre Value for WA: \$381/acre

Number of Growers in WA: 3500

Value of Production in WA: \$119,000,000

WA Percent of U.S. Production: 75%

## Page 8 - Wheat

Wheat has consistently been in the top six ag products in Washington State. In 2011, Apples were the top value, followed by dairy products, wheat, potatoes, hay, and cattle & calves (beef). These top six accounted for 69% of the value of all ag commodities raised in 2011 in Washington.

### Writing Prompts

1. Create a narrative about making cheese. Who might have discovered that enzymes in a calf's stomach would turn milk to curds?
2. Tell why weather and climate are important to farmers. For instance, which fruits can we raise in Washington, and which ones will not survive here?
3. What is your favorite food grown in Washington? Describe how it looks, smells, and tastes. What color and texture does it have?
4. Some people believe that the lock and dam system on the Snake and Columbia Rivers should be removed. Do you agree or disagree? Write to persuade a friend of your opinion. Give reasons to support your position.
5. Poetry can be a great way to express ideas. Write a cinquain poem about a Washington commodity.

#### CINQUAIN INSTRUCTIONS

- Line 1: a person, place, or thing (noun)  
Line 2: two words that tell about the noun (adjectives)  
Line 3: three *ing* words that show action about the noun (verbs)  
Line 4: one four-word phrase or sentence about the noun  
Line 5: the noun again (or a word that means the same thing)

Pumpkins  
Orange, round  
growing, carving, painting  
the candles are flickering  
Jack-o-Lantern



### Learn More About Nutrition

Excellent materials are available at the dairy council website [www.eatsmart.org](http://www.eatsmart.org) Check it out: WA teachers can receive **\$20.00 FREE materials** each calendar year.

### Get the Facts

[www.nass.usda.gov/wa/](http://www.nass.usda.gov/wa/) - WA State agricultural statistics

### Become a Washivore

Check out the brand new website [www.washivore.org](http://www.washivore.org) for fun facts and profiles of Washington Ag products.

Visit the Washington Ag in the Classroom web site at:  
<http://www.waic.net/>

### Publication and Credits

Ag@School is a publication of Washington Agriculture in the Classroom, a non-profit entity created in 1981 to encourage and help teachers increase agricultural literacy in their students. Both public and private groups including the WA Dept. of Agriculture, WSU, commodity commissions, farm organizations, agri-businesses and individuals, support this mission. Teachers may reproduce any pages for use.

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## Subscribe to Ag@School

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- Your name, grade you teach, and number of students in your class
- Your school's full name (no abbreviations please)
  - School mailing address (for postal delivery)
  - The county in which your school is located
  - School phone number including area code

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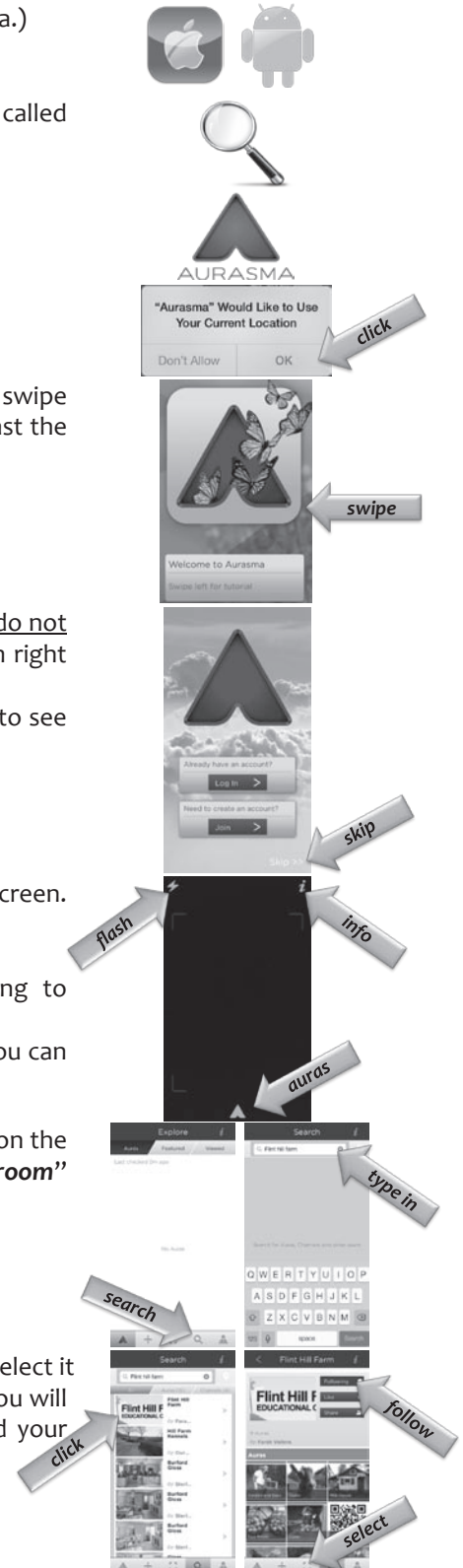
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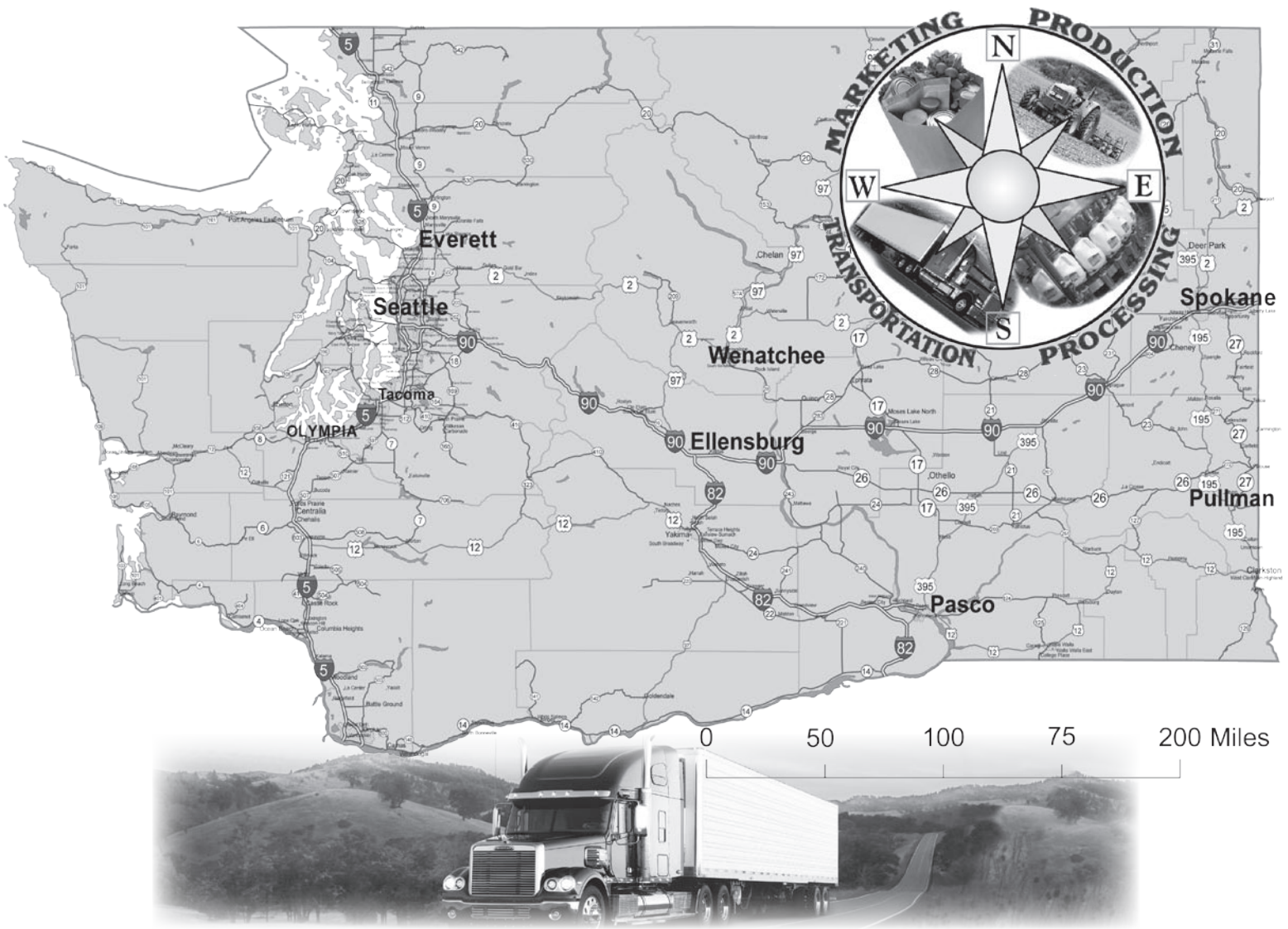
## An Augmented Reality

### How to Participate:

- 1 You must have a smart phone or tablet with a data plan.\* (This app uses minimal data.)
- 2 From your “App Store” or “Google Play”, search for and download the app called **Aurasma**. (It is free, fun, and takes up little space on your device.)
- 3 Once Aurasma is downloaded (which only takes a few minutes), open the **icon**.
- 4 You will be asked to **share your location**. You should click “OK”. (You must also have your **Location Services** turned on in your phone’s settings.)
- 5 You will then see Aurasma’s **Welcome Screen**. You will be offered a tutorial if you swipe left, but you can quickly skip past these steps (and revisit them later) by swiping past the five tutorial screens.
- 6 Once you swipe to the left past the tutorial, you will get to the **Log In Screen**. You do not have to create an account for this experience – instead, click “**Skip**” in the bottom right hand corner. (They hide it because they want you to sign up, but you may want to sign up later to see what other things are in there!)
- 7 You will then see your camera is activated and only three icons are present on the screen. (Here, the image is black so you can better see the icons.)
  - a. The top left is the **flash** icon and can be used if it is dark where you are playing.
  - b. The top right is the **information** icon, which gives you information relating to everything on your screen at the time.
  - c. The bottom icon allows you to find **auras**, or the augmented reality programs you can use. You will click the **auras** icon.
- 8 The **Explore** auras tab will open. There are thousands! To find this classroom, click on the search icon on the bottom menu bar, and then type in “**Washington Ag in the Classroom**” into the search bar at the top. (It does not have to be capitalized for it to work.)
- 9 When you click search, **Washington Ag in the Classroom** should be your top result. Select it by clicking on the icon or name. Click “**Follow**” at the top right of the screen, and you will then be “Following” the aura. Select the **camera** icon at the bottom center and your camera will again be activated. You are now ready to play!

### What You Will See:





Imagine you are a truck driver and your office is in Seattle. Your boss gives you the following work schedule. Trace your driving route on the map. In the blanks, write the name of the highway you would use to get to that stop and how many miles you traveled.

1. Pick up raspberry jam from a processor in Everett.  
Highway \_\_\_\_\_ for about \_\_\_\_\_ miles
2. Pick up fresh apples at a fruit packing plant in Wenatchee.  
Highway \_\_\_\_\_ for about \_\_\_\_\_ miles
3. Deliver the apples and the jam to a supermarket in Spokane.  
Highway \_\_\_\_\_ for about \_\_\_\_\_ miles
4. Pick up a load of wheat flour near Pullman.  
Highway \_\_\_\_\_ for about \_\_\_\_\_ miles
5. Drop off flour in Pasco; pick up sweet corn.  
Highway \_\_\_\_\_ & \_\_\_\_\_ & \_\_\_\_\_ for about \_\_\_\_\_ miles
6. Deliver corn to processing plant in Ellensburg.  
Highway \_\_\_\_\_ for \_\_\_\_\_ miles
7. Pick up hay and deliver to port of Seattle for shipment to Japan.  
Highway \_\_\_\_\_ for about \_\_\_\_\_ miles
8. What is the total number of miles traveled?  
\_\_\_\_\_ miles
9. How many different highways did you travel? \_\_\_\_\_
10. How many cities did you visit? \_\_\_\_\_