EDUCATOR GUIDE
AQUIFER LAB MODELING APPLICATION & PORTAL

This guide will provide a brief overview of how the Aquifer Lab modeling application works to prepare educators to support their students when completing the activity. It also provides guides and how-to information for using the educator portal feature of the Aquifer lab.

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Educator Supplies Needed

- computer with internet access
- email account (for teacher portal)

Student Supplies Needed

- computer with internet access
- calculator (basic)

Modeling Activity Abbreviations & Definitions

G - Ground Elevation

S - Water Table Elevation in static conditions

P - Water Table Elevation in pumping conditions

i - Gradient

n - Porosity

K - Hydraulic Conductivity

ft - feet

Elevation X - the water table elevation of Well X

ΔElev X to Y - the difference between the water table elevation of Well X and the water table elevation of Well Y

Dist X to Y - the distance between Well X and Well Y

MODELING APPLICATION OVERVIEW

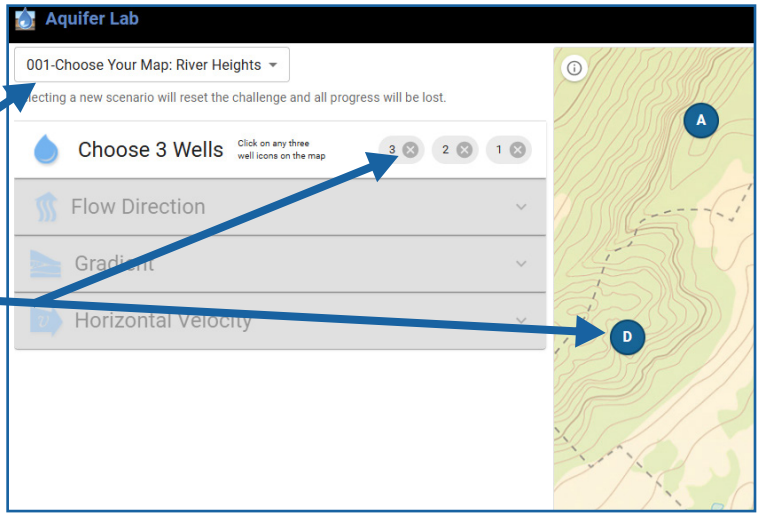
Getting Started

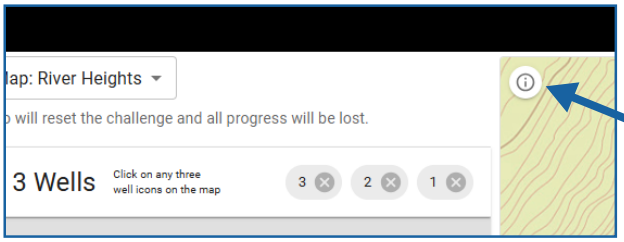
Go to AquiferLab.com using any up-to-date browser to access the Aquifer Lab modeling application. This will take you to the general practice version available for you and your students.

Helpful Features

Select a scenario from the drop-down menu. Each scenario has unique well placement, topography, and geology.

To choose three wells, click the wells on the map. You can unselect wells by clicking them again or by clicking the 'x' button next to them in the list.

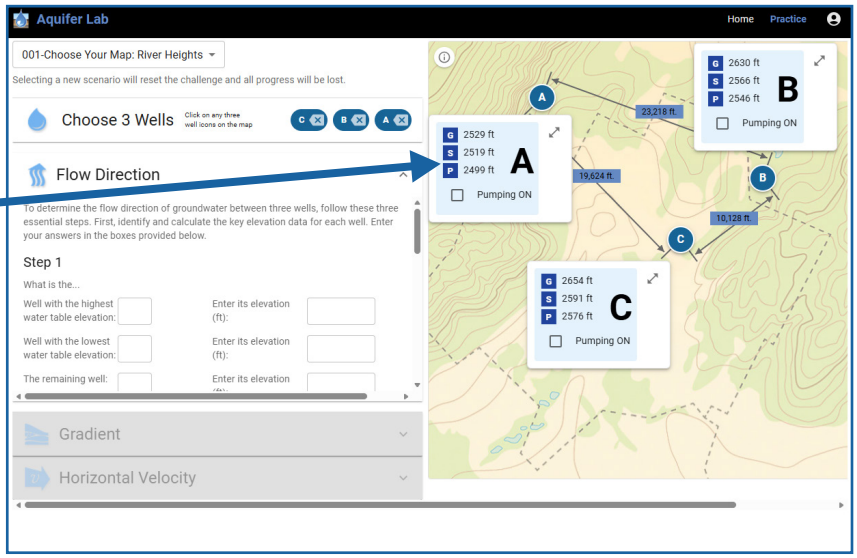




Click the information icon to open a pop-up with helpful details about using certain features.

Use **S-value** (*water table elevation in static conditions*) for **wells not pumping.**

Use **P-value** (*water table under pumping conditions*) for wells that **are pumping**.



MODELING APPLICATION OVERVIEW

Flow Direction

As you complete each section, the next section will light up and will become available.

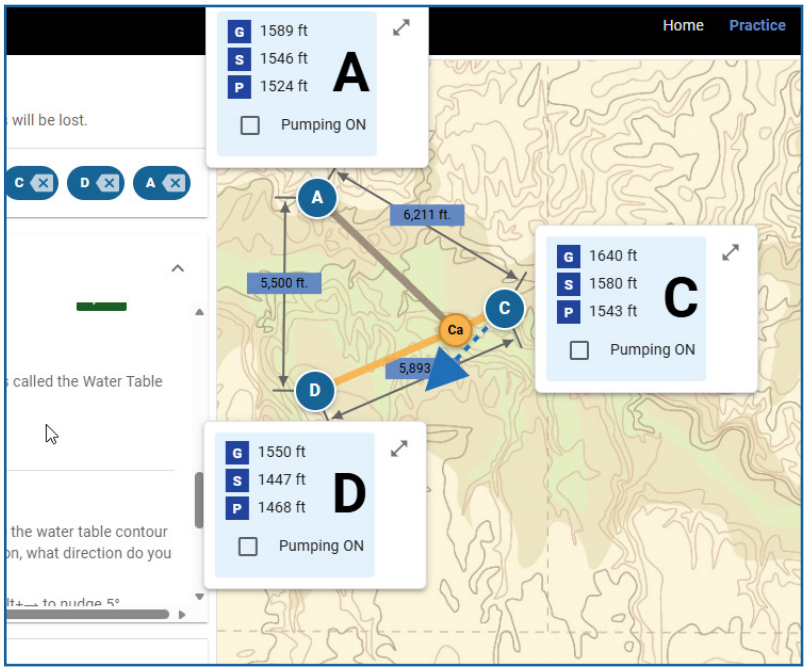
You may move the well information pop-up boxes by clicking and dragging.

Select this check box to turn pumping ON for a well. Select it again to turn pumping OFF.

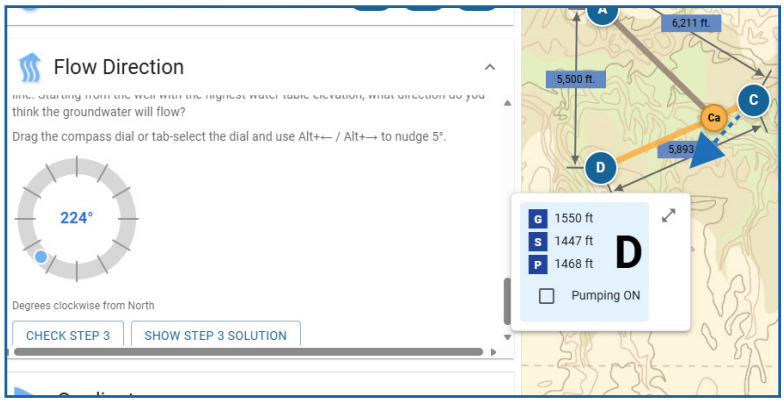
As you work through steps, additional lines will form on the map.

The first line to appear is **yellow** and represents the distance from the well with the highest water table elevation to the well with the lowest water table elevation.

Next, a **grey** line will appear when you complete the formula in Flow Direction Step 2. This line is from the middle well to a point on the yellow line where the water table is equal to that of the middle well. **This line represents the water table contour line.**



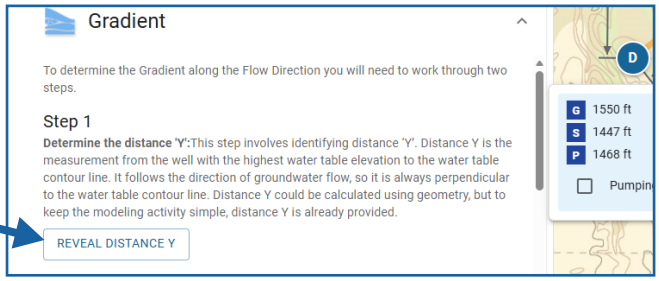
The flow direction (represented by a blue dashed line) will always be perpendicular to the contour line. The compass will accept an answer that is within 10 degrees of the correct answer.

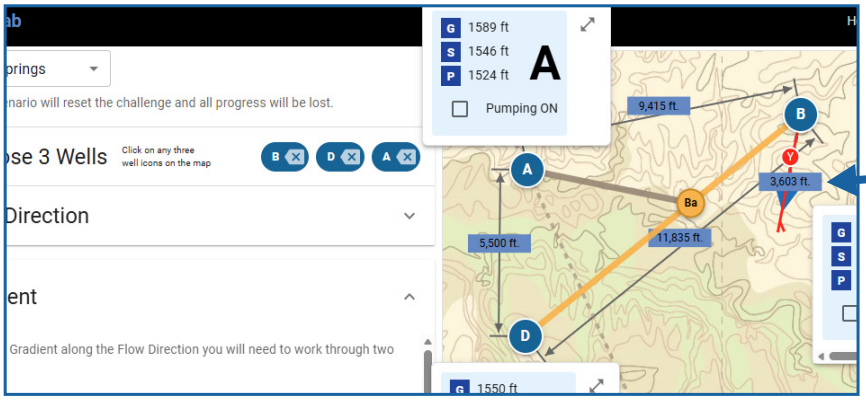


MODELING APPLICATION OVERVIEW

Gradient

Start by clicking "**Reveal Distance Y**'.



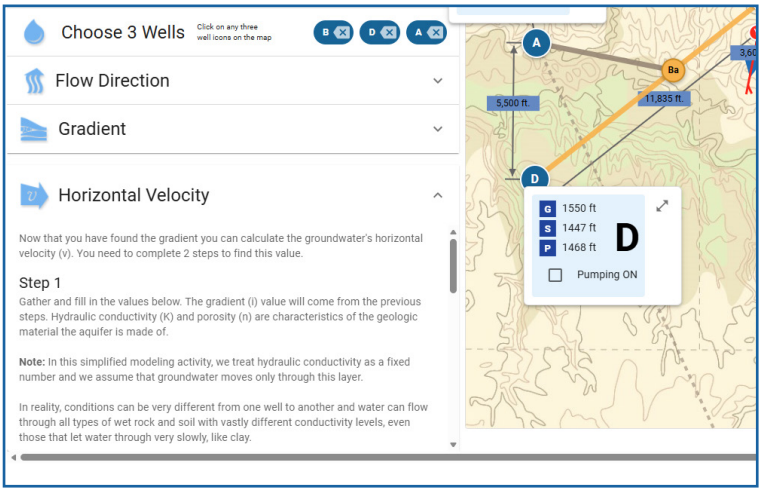


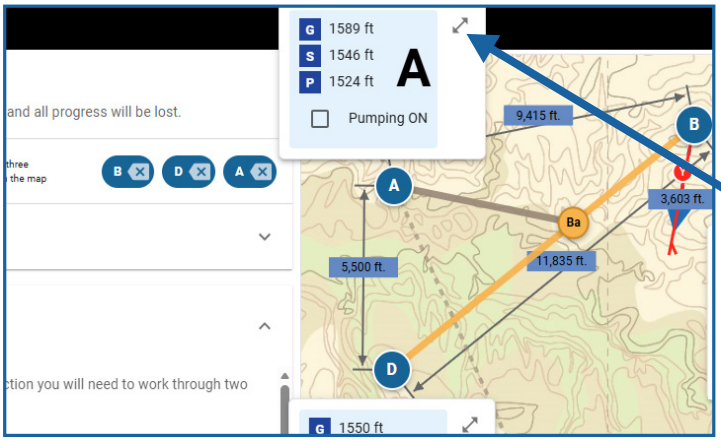
The distance is represented on the map by a **red** line; the distance in feet will appear next to it (3,603 feet in this instance).

Horizontal Velocity

In Step 1 of Horizontal Velocity, you will be prompted to gather and enter the three key data points that represent the variables in the Darcy's Law equation. This step has specific directions to help you determine the correct answer for each.

The first data point is for variable *i*, or gradient, which can be gathered from the answer in the previous step.





The next two data points, variable *K* (hydraulic conductivity) and *n* (porosity), are characteristics of the geologic material the aquifer is made of.

To find these, open the geology table for the well with the highest water table elevation by clicking the double-sided arrow in the top right corner. This table displays the aquifer material, its hydraulic conductivity, and its porosity.

MODELING APPLICATION OVERVIEW

Horizontal Velocity (Continued)

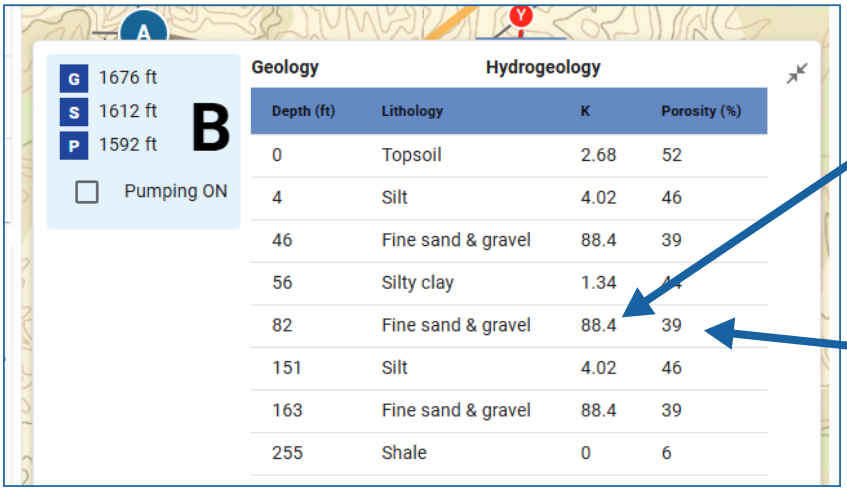
Note: In this simplified modeling activity, we assume that groundwater is mainly flowing through the saturated layer with the highest conductivity, *K*. Use the geological layer within the saturated zone that has the highest K value.

To determine which geology layers are in the saturated zone, you must first determine the depth of the water table. Find the depth of the water table by subtracting the water table elevation (S in static conditions or P in pumping conditions) from the ground elevation (G).

G - S = water table depth in feet

In this example: **1,676 ft - 1,612 ft = 64 ft**

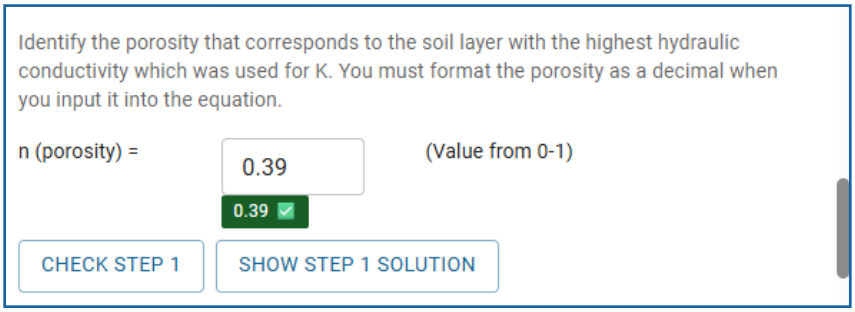
The water table is found 64 feet below the surface in the second "Fine sand & gravel" layer. You will review the water table layer and all layers below it's depth, then select the one from this group that has the highest hydraulic conductivity.



Depth (ft)	Lithology	K	Porosity (%)
0	Topsoil	2.68	52
4	Silt	4.02	46
46	Fine sand & gravel	88.4	39
56	Silty clay	1.34	41
82	Fine sand & gravel	88.4	39
151	Silt	4.02	46
163	Fine sand & gravel	88.4	39
255	Shale	0	6

For this activity, identify the soil layer in the saturated zone with the highest hydraulic conductivity and use that number for K.

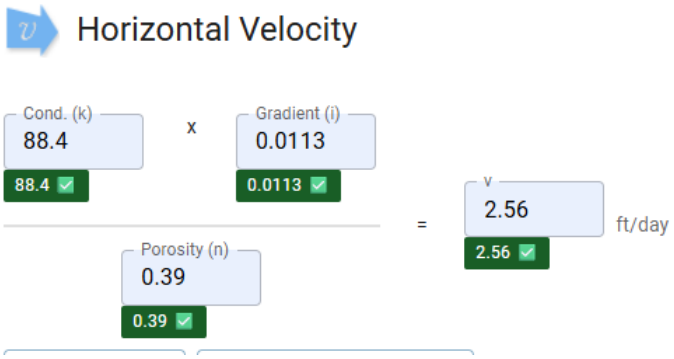
Then identify the porosity that corresponds to the soil layer with the highest hydraulic conductivity which was used for K.



You must format the porosity as a decimal when you input it into the equation. In this example, you convert 39% to 0.39.

MODELING APPLICATION OVERVIEW

Horizontal Velocity (Continued)



Complete the equation (Darcy's Law) in Step 2 to find the Horizontal Velocity. In this scenario, the horizontal velocity is 4.15 feet per day. Select "Submit Answers" to see your score.

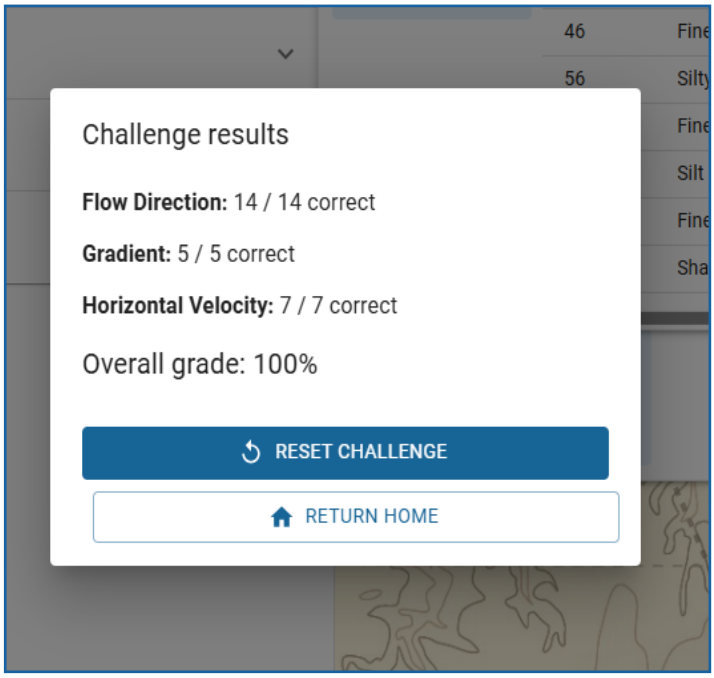
Congratulations!

You have successfully calculated the speed and direction of the scenario's groundwater flow. Using this information, you can determine in which direction and how fast a contaminant will move through an aquifer.

Select "Reset Challenge" to erase all currently input answers.

Select "Return Home" to go to the main start page.

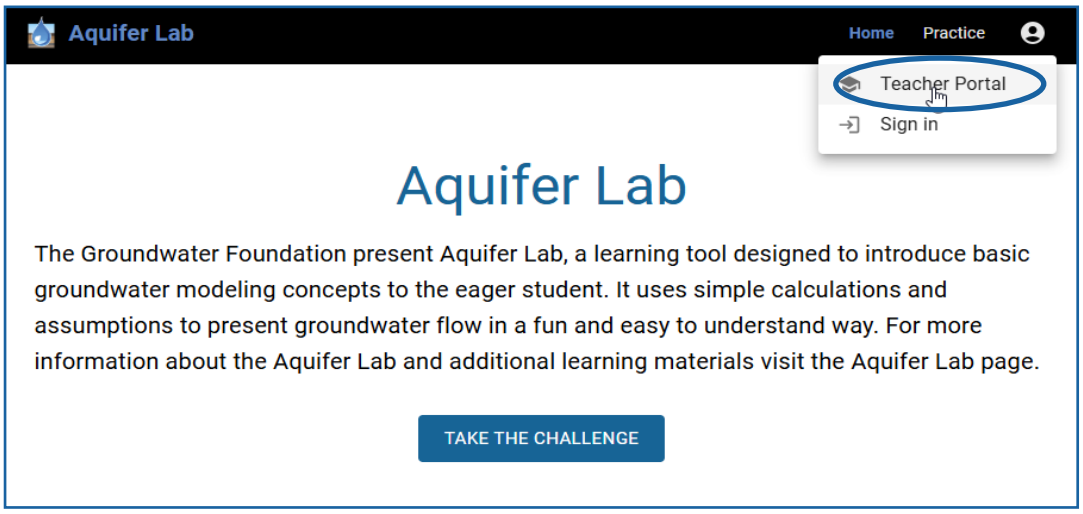
Click anywhere on the previous scenario to close the results pop-up and revisit your work.



TEACHER PORTAL

Accessing the Portal

On the Aquifer Lab modeling application website, select the profile icon in the top right corner and then select “Teacher Portal” from the dropdown.

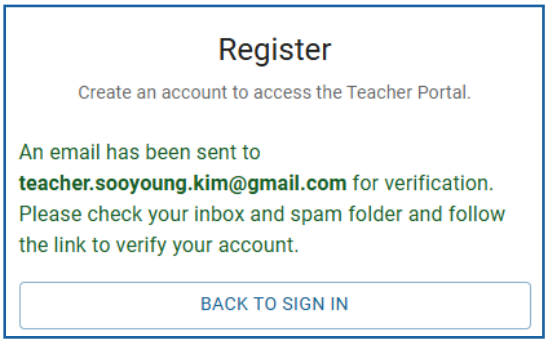


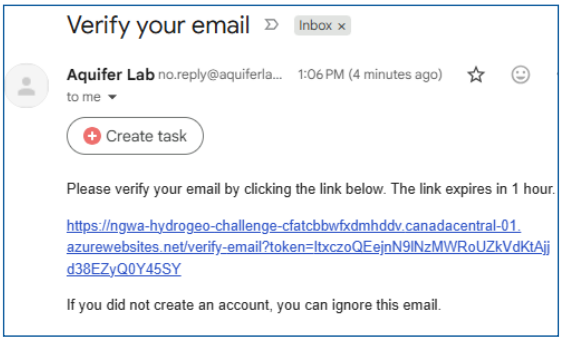
Creating an Account

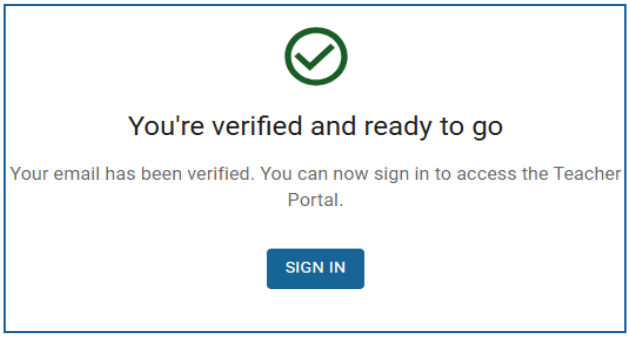
1. From the Teacher Portal main page, select “Register”.

2. Input your email and password and select the “Register” button.

3. Check your email for a verification email. Select the link in the email, it will open a new page on the Aquifer Lab website. Select the “Sign In” button on that page.

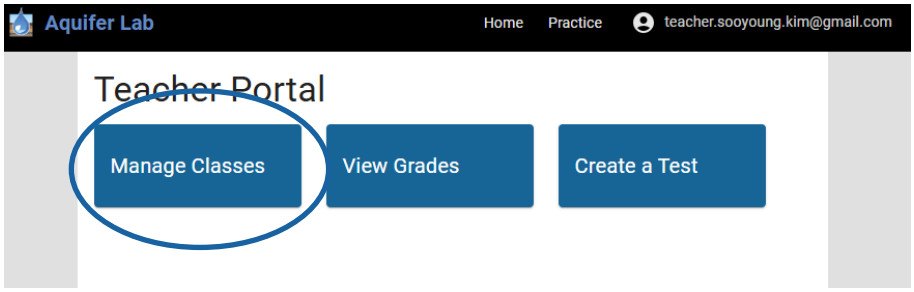




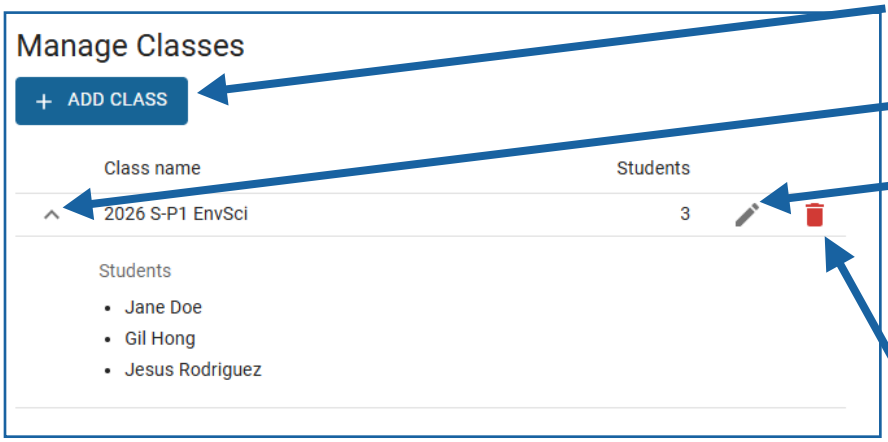


Managing Classes

From the portal main menu, select “Manage Classes”.



Below are key features on the “Managing Classes” page.



Select “+Add Class” to add a class to your list.

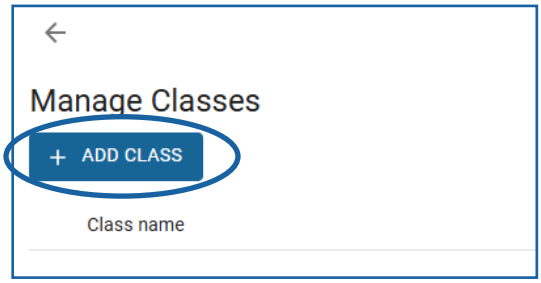
Select the up arrow next to a class name to see the list of students in that class.

Select the pencil icon next to a class name to edit the students in that class, including adding and removing students.

Select the trash bin icon next to a class name to delete that class from your list.

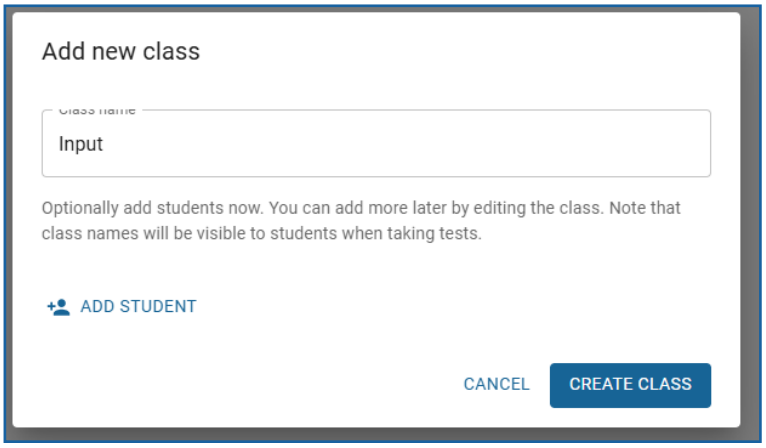
Add a Class

1. From the “Manage Classes” page, select “+ Add Class”.



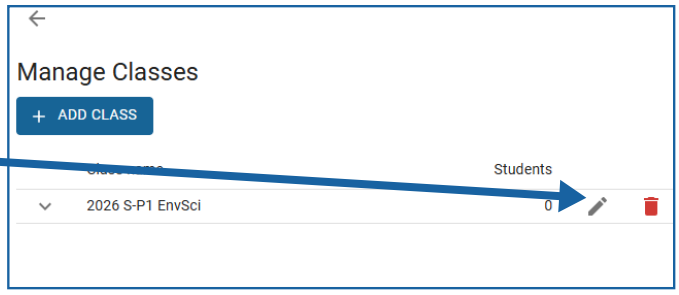
2. Input a name for your class. Keep in mind that this class name will be visible to your students. Select “Create Class” when finished.

You can add students to your class now by selecting the “Add Student” button, or add students later.

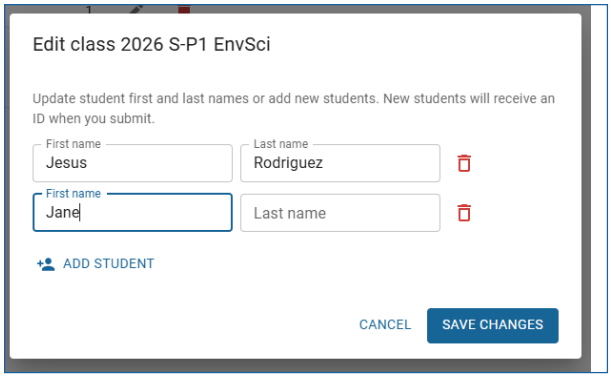


Editing a Class

1. From the “Manage Classes” page, find the class you wish to edit and select the pencil icon next to it’s name.

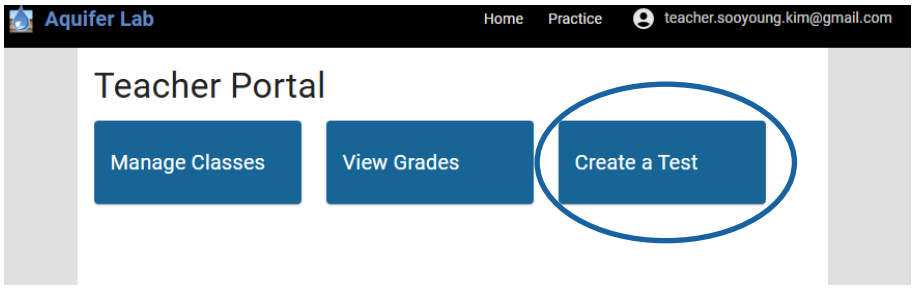


2. From here you can:
   - add a new student to the list
   - edit the names of existing students
   - delete a student from the list

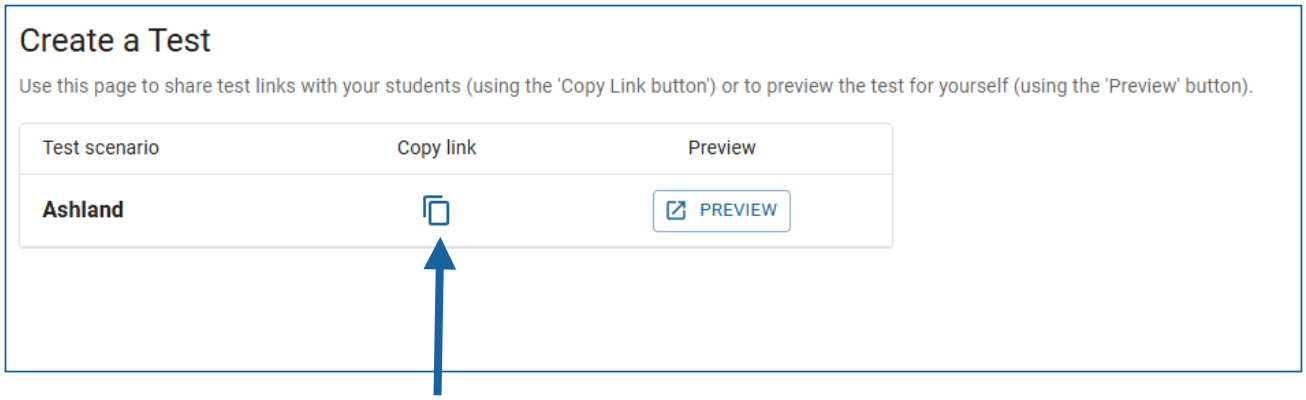


Managing Tests

From the portal main menu, select “Create a Test”.



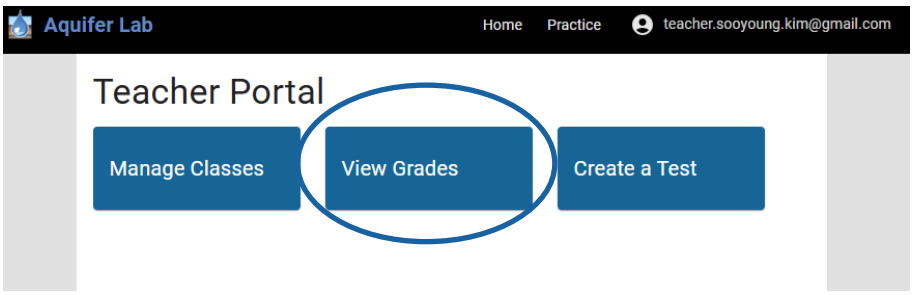
From this page you can view the Aquifer Lab’s test scenario. This scenario is not publicly available to students. Students will only be able to access this test using the unique URL provided by teachers who use them in tests for their classes.



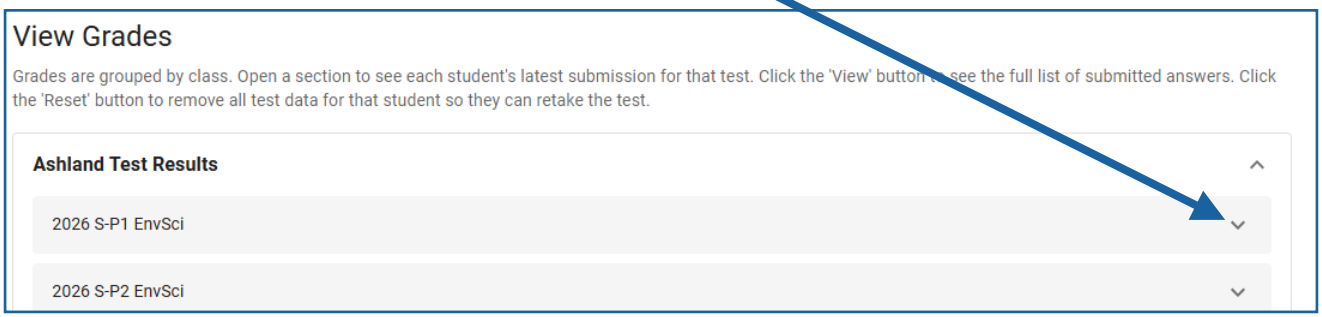
By selecting the “Copy Link” icon next to a test, you will automatically be given a URL that is unique to your teacher account. Using this link, students will be able to access the test scenario where they will be prompted to choose their class and name from a dropdown menu. Share this link with your students, all students will be able to use this same link.

Managing Grades

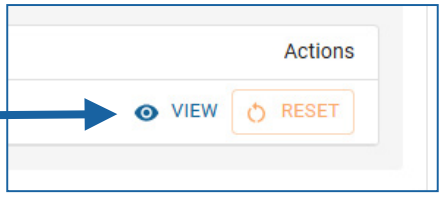
From the portal main menu, select “View Grades”.

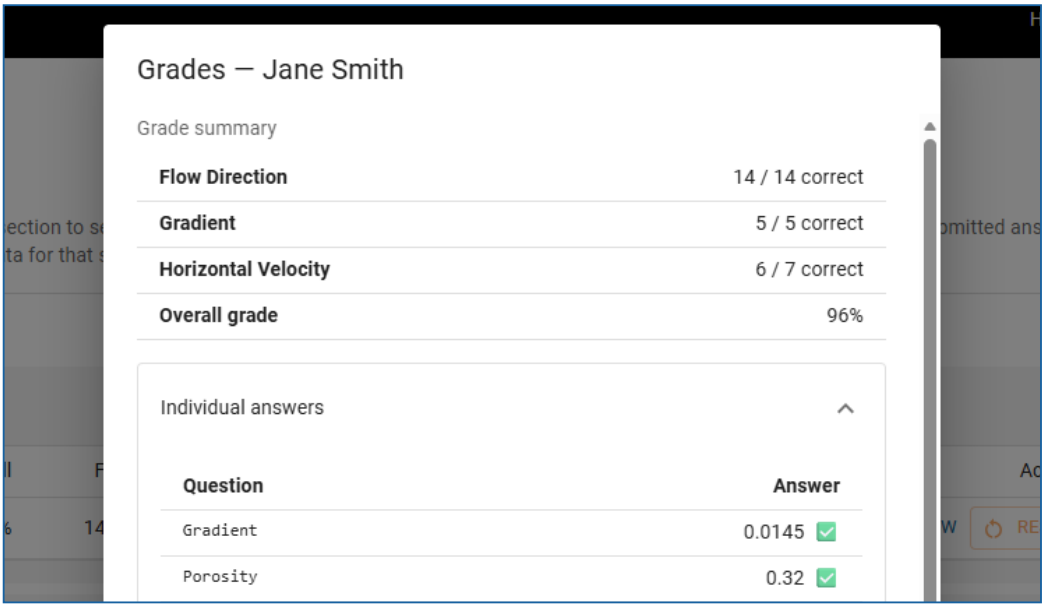
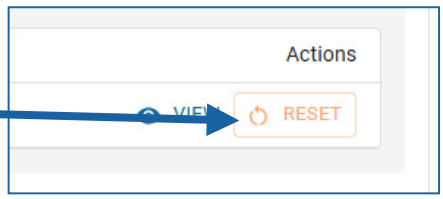


Grades are grouped by class. Select the carrot icon next to a class name to open the class and see each student’s latest submission for that test.



Select the “View” button to see the full list of submitted answers for a student.





Select the “Reset” button to remove all test data for that specific student so they can retake the test.