Changing the Location on the ISS-ABOVE

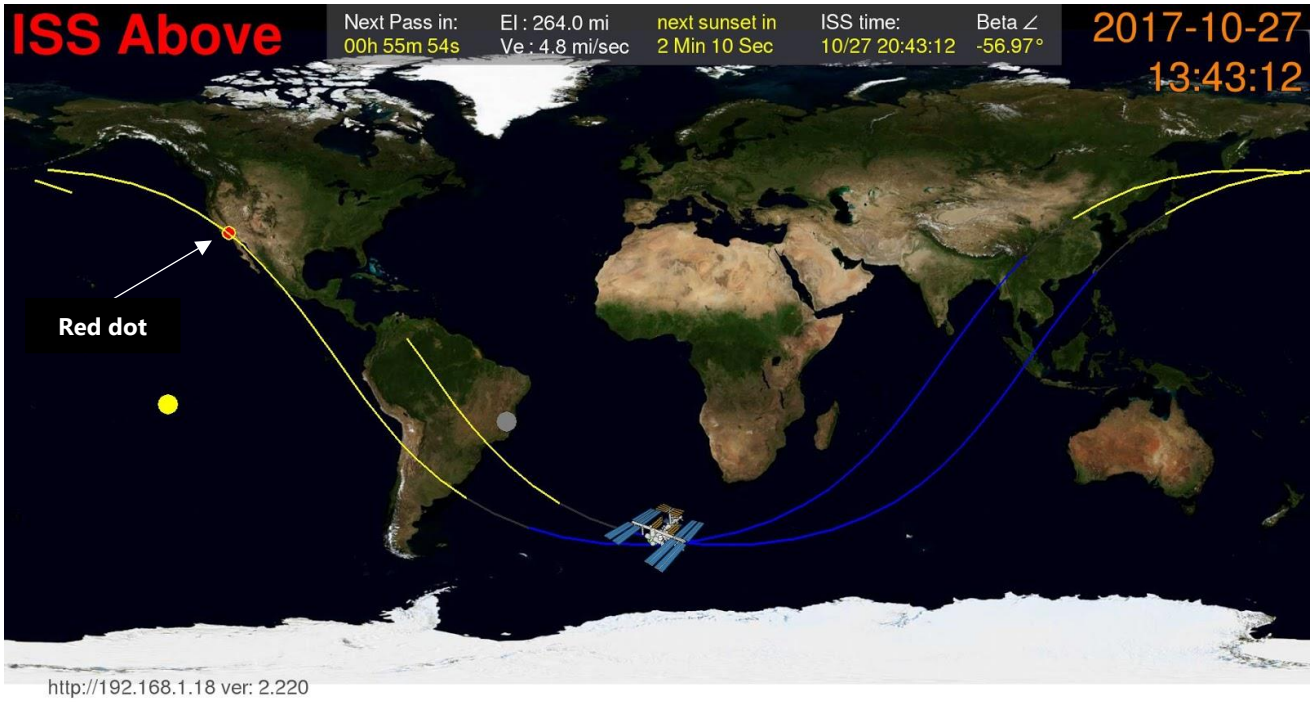
Subject/Grade Level:	Space and the Solar System / Middle School (Grades 6-8)
Lesson Objective(s):	Students will learn how the location of the ISS at various times of the day differs **relative to the location set on the ISS Above** (the location we are using to measure where the ISS is).
Materials:	• ISS Above (set up and ready to go) • Wall map of the world • Pushpins
NGSS Essential Standards and Clarifying Objectives:	*MS-ESS1-3:* **Analyze and interpret data to determine scale properties of objects in the solar system**. Emphasis is on the analysis of data from Earth-based instruments. **Science and Engineering Practices:** • Analyze and interpret data to determine similarities and differences in findings. **Disciplinary Core Ideas:** • The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.. **Crosscutting Concepts** • Scale, Proportion and Quantity ✓ Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. • Interdependence of Science, Engineering, and Technology ✓ Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.
Differentiation strategies to meet diverse learner needs:	• Think-pair-share, for students that learn best when engaging with classmates. • Multisensory learning, to accommodate students that are auditory learners and visual learners, as well as encourage students to engage their senses in the learning process. • Awareness of social and cultural backgrounds of students to reinforce the real-life application of what they are learning.
Student Worksheet	Worksheet to capture data about the ISS-ABOVE in different locations.
Skills Needed	Students need to work with latitudes and longitudes, time zones and degrees. Extra information is provided on Latitude/Longitude in the **Additional Resources** section of this Handbook, if needed.

ENGAGEMENT

Location of the ISS-ABOVE

Hand out the Student Worksheet.

Move to the ISS-ABOVE world map/orbits screen:



Look on the map for the location of your school. It should show as a red dot. (In the screenshot above it's in Pasadena, CA.) You may also see a yellow dot for the Sun and a grey dot for the Moon. All of the data that the ISS-ABOVE displays is driven by the current location (the red dot, which is where the ISS-ABOVE 'thinks' it is).

Questions

1. What do the students notice about this map of the world? (For example, they may notice forest, deserts, snowy regions and oceans and that there are no boundaries between countries and people; only land and water masses.)
2. The ISS graphic moves from West to East updating very few seconds. Do the students notice that the ISS is moving?
3. Roughly how many time zones away is the ISS from your school? In the image above its looks like it's 8 hours ahead – the difference between, say, UK time (where it's nighttime) and the time in California (where it's daytime).
4. Do the students notice that there's a gray arc on the orbit between the yellow of daytime and the blue of the night? Those are the periods of sunrise and sunset, when the ISS has best visibility if it happens to be above you.

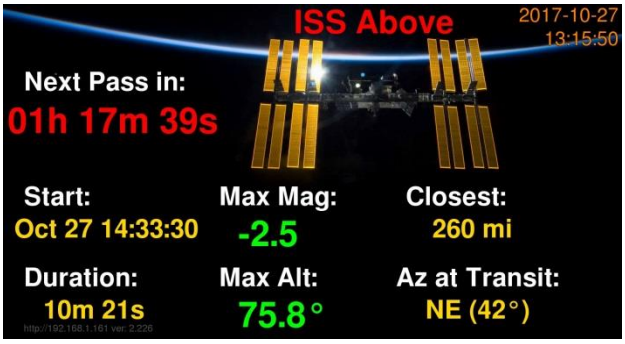
Pick a place on the map where the ISS will pass overhead (i.e. the place lies under the orbit arc).

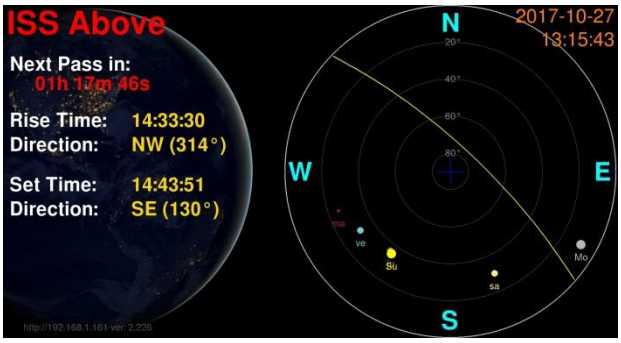
Questions

1. When would the ISS pass over that location? Students need to note the time and estimate where the ISS is and how many time zones ahead if the ISS the chosen county/city is. NOTE: The ISS takes 92 minutes to orbit the Earth.
2. When the live video from the ISS shows above the new location, would the camera feed be different? In what way?
3. What's the distance of the ISS when it's above you?
4. When will the ISS be above your country, or your family's country, or your ancestors' country?

EXPLORATION

On the Next Pass screen, the data is for the next pass over your location:





Ask students to use their Worksheet to note their location (City) in the Column marked Current Location and the Next Pass in, Start, Max Mag, Closest, Duration, Max Alt and Az at Transit details in the same column from the screen on the left as shown above.

On the Next Pass In screen, have the students sketch the fly by circle on the right-hand side of the screen (on the back of their Worksheet) from the screen on the right as shown above.

Changing the location of your ISS Above

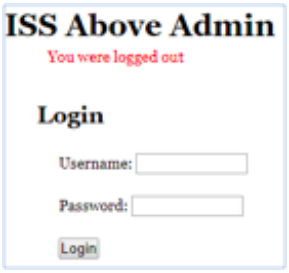
You're going to use a browser to access the Admin of the ISS-ABOVE and change the location. The students will note the differences on their worksheet.

Before you change to a browser, make a note of the ISS-ABOVE's IP address from the bottom left of one of the ISS-ABOVE screens:

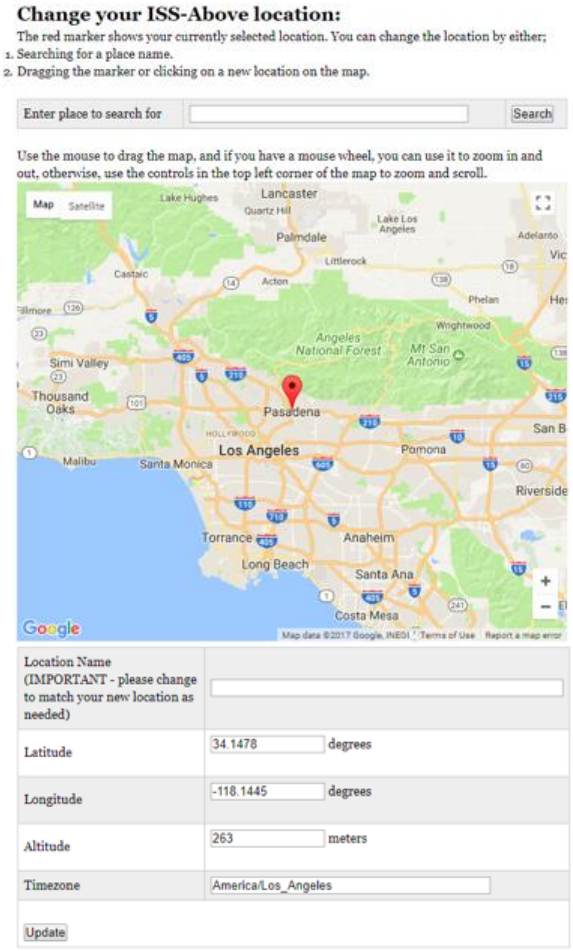
Now, use any browser on a desktop, laptop or tablet and type your IP address in the URL bar

http://(ip address)/login
e.g. http://192.168.1.84/login

The screen to the left appears.
Enter the username **admin** and the password **nasa**. Click **Login.**

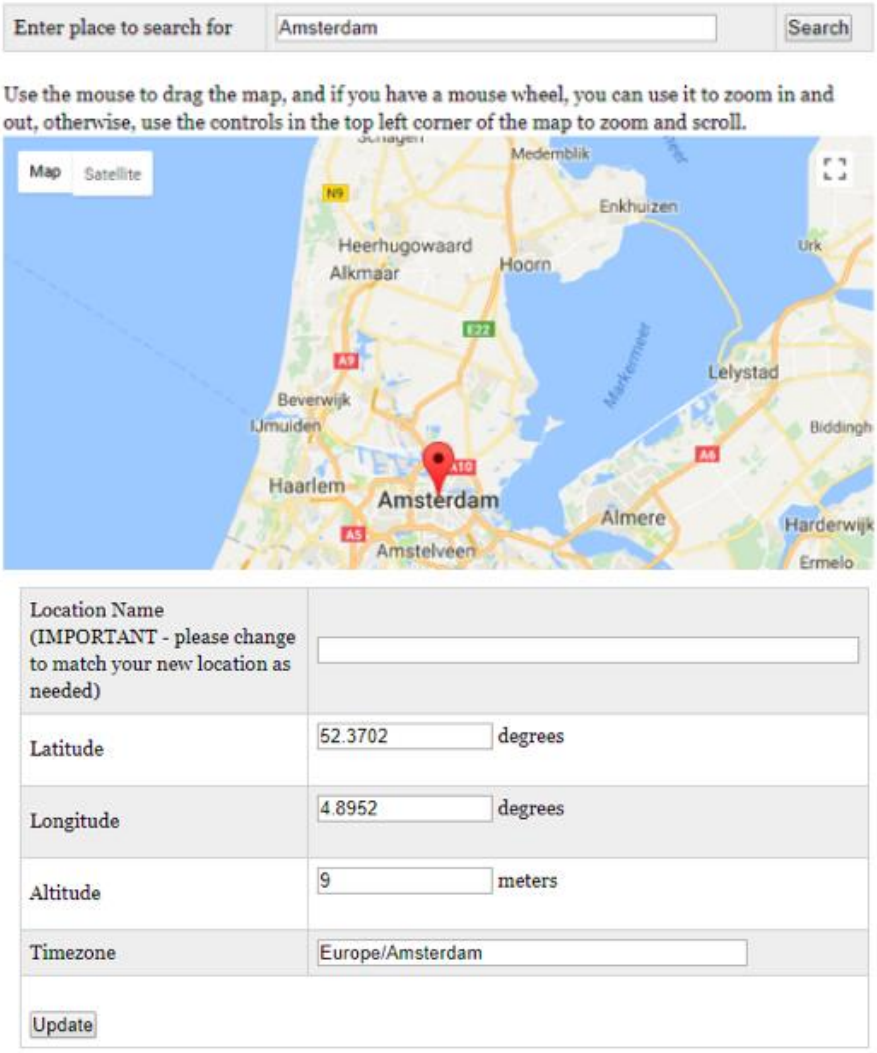


Project your screen to the class if possible. The screen below will appear:



Students should note the Latitude and Longitude of your current location on their Worksheet table.

Now, in the **Enter place to search for** field, type *Amsterdam* and click **Search**. The screen below should appear:



Students should add the Latitude and Longitude for Amsterdam to their table.

Now, click Update. Some red text displays at the top of the screen:

Latitude changed

Longitude changed

Elevation changes

Timezone is now set to Europe /Amsterdam

Location name change to:

ISS Above code will be re-started now in order to accept the changes

The ISS Above should now be restarting.

Student Activity

In the second column of the student table, gather the same information for the Amsterdam location.

Questions

1. How can you tell you're really in Amsterdam?
2. How many hours difference is it between your school and Amsterdam?
3. What do you think people in Amsterdam are doing right now?
4. What time is it for the people on the ISS?
5. Can you work out which time zone the ISS is set to?
6. Why do you think the time on the ISS is the same whether it's over your school or over Amsterdam?
7. How long is it until the next pass over your school and over Amsterdam?
8. Will you be able to see a view of Amsterdam from the ISS during the school day?

ELABORATION

Time allowing, change the location again and use your World Map and push pins. A time zone map is provided in Unit 1 Lesson 1.

For each location you have chosen to change the ISS Above settings to, document it on a pushpin map. Or, make a chart to see if that location does or does not ever have a visible pass.

NOTE: You can also use an interactive push-pin map, but you must register first. It's free for one map and up to 30 pins. https://www.pinmaps.net/mymaps/

EVALUATION

Students can be assessed on their understanding of the relevant vocabulary terms for this lesson, as well as the relevant concepts:

Have students define in their own words:

1. Maximum Magnitude (Max Mag)
2. Maximum Altitude (Max Alt)
3. Azimuth (Az)

Questions

1. Explain why there are different time zones on Earth?
2. Do these time zones impact our ability to see an active pass of the ISS? *(really time zone is not the factor that determines whether the ISS will pass over a location. The ISS passes over 95% of the worlds populated areas every single day, but of course at different times)*
3. Where are some locations (e.g. countries) where you would never see an active pass of the ISS? What latitudes would not be able to see the ISS-ABOVE?
   hint: The ISS orbit is inclined by 51.6 degrees from the equator. That causes the ISS to move between about 52 degrees north and south. If any city is above 52 degrees north the ISS will still rise above the horizon several times per day but it will always be lower in the sky than locations closer to the equator. For example Fairbanks Alaska is at 64.8 degrees north the ISS will still rise above their horizon but will always be in the southern part of the sky and will never rise above about 9 degrees in their sky. Warning. ***DO NOT SET YOUR LOCATION*** *to extreme north or south (above 66 degrees). The result will be that your ISS-Above will not have ANY pass of the ISS – which would get rather confusing as there will never be ANY next pass information).*

Student Worksheet – Changing Location

	Current Location	New Location
City, Country	, USA	Amsterdam, Netherlands
Date and Time		
Time Zone (GMT +/- number of hours)		
ISS Time (top of the world map/orbit screen)		
Next Pass (h m s)		
Start		
Duration		
Closest		
Latitude*		
Longitude*		
Max Mag		
Max Alt		
Az at Transit		

*The latitude and longitude of the ISS Above can be found at the bottom of the browser screen (not on the ISS Above screens!)

Add the details for **your location** (from the Next Pass In screen) with the fly-by map:

Looking at the Earth

Draw the fly-by map for Amsterdam (once the location has changed):