



Intermediate Bundle 3-6

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Intermediate Bundle

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Intermediate Bundle Notes:

- If you need a Google Doc version of this document to edit for your class or group, please email me at brittani_bluhm@dpsk12.net
- Feel free to redesign the labs for partner work, small groups, etc... However, the essence of STEM is **cooperative** work, so limit independent work as much as possible.
- Technology referred to in the labs is all Chromebooks and Google-based apps. This is **not** required. Students may utilize whatever technology-based tools are available to them (i.e. iPads, Microsoft Office, etc...)
- Do not attempt to finish these labs in one sitting. The **5 E Lesson Plan** model is recommended. Where these labs serve as the "explore" portion of your lesson.
- Most labs need an intro whether it is a read aloud video, whole class brainstorming session, etc... to access prior knowledge or engage the students for the labs.

Above all, give your students the opportunity to create, make mistakes, question their constructs, and have fun!

—Brittani



LAB SCAVENGER HUNT

Welcome to the STEM lab!

Complete the following scavenger hunt with your group observing rules of **safety at ALL times**.

Use a dry erase marker to check off or respond below:

- Find the two exits in the lab.
- Take out one set of safety goggles for each team member (leave them on the table).
- Find the pencil sharpener.
- Get one magnifying glass for the team.
- Find a Chromebook and charger
- Get a 50 ml beaker for the team.
- Find the scales and microscopes.
- Find the fire extinguisher.
- Get one wooden piece for the team.
- Get one pencil for the team.
- Find the large and small clipboards.
- Find the tape.

What color is the sign for the eye wash station?

How many sizes of lab coats are available?

STEM LAB SHEET

SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS



Directions: Read all of the steps for success and raise your hand if you have any questions before you begin.

Steps for Success:

1. Put on safety goggles.
2. Use the magnifying glass to observe your rock.
3. Tell a friend in your group what you observed.
4. Pour your cup of liquid into the beaker. beaker
5. Tell another friend in your group how much water you measured.
6. Pour the water from the beaker back into the cup.
7. Use the ruler to measure your feather.
8. Tell a friend in your group how long your feather is.
9. Use the magnifying glass to observe the feather closely.
10. Use the syringe to soak up 5ccs of water.
11. Put the 5 ccs of water back in the cup.
12. Put all materials and tools back in the box as you found them.
13. Your teacher has put a specimen on the overhead.

Discuss with your group what you see.

Area/EDC/Animal Habitat
No safety equipment required

DIRECTIONS: Today you will design a “happy habitat” for your provided animal using Google Drawing. Read all of the “Steps for Success” and raise your hands if you have any questions before you begin.

STEPS FOR SUCCESS:

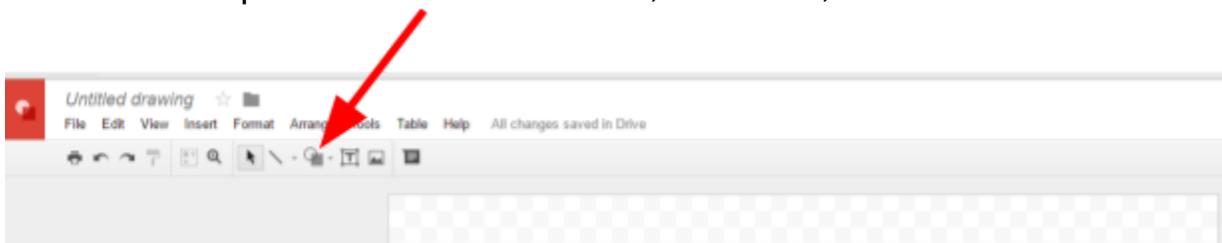
1. Open a browser.
2. Click on the web address in the address bar and type in **Google Drawing** and press Enter.
3. If you are prompted to sign in, use the following credentials:
 Username: _____ (you will need to create your own Google account)
 Password: _____
4. Start by naming your “Happy Habitat”



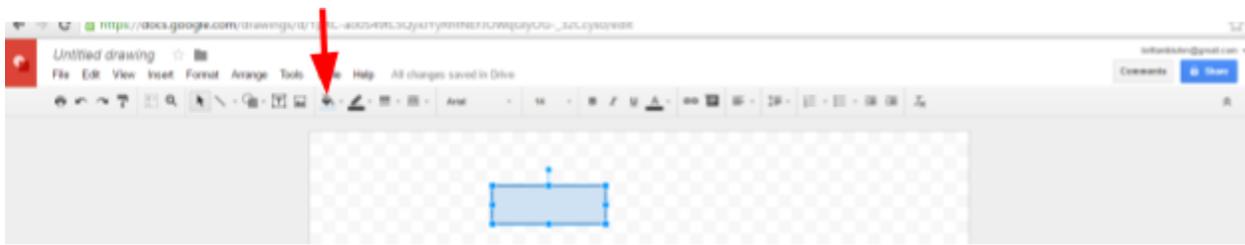
5. Replace *Untitled drawing* with the following:

6. **grade/homeroom/animal**

7. Use the shape button to insert needs, materials, etc...



- Choose the shape. Click on the drawing space. And drag to the size needed.
- Change the color using the little paint can icon.



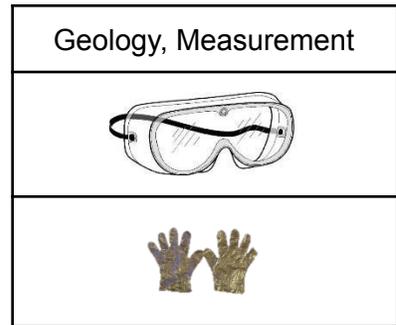
8. Requirements:

- Meet basic needs:
 - Food
 - Water
 - Space to rest
 - Area to exercise
 - Protection from predators
- Meet intellectual/social-emotional needs:
 - Proper exercise equipment
 - Area to socialize with others of the same species
 - Games or other intellectually stimulating activities

9. Label all of your requirements for your habitat



LAB SHEET



DIRECTIONS: You have 5 minerals. You need to identify which one is magnetite and which one is calcite.

Read all of the “Steps for Success” and raise your hands if you have any questions before you begin.

STEPS FOR SUCCESS:

1. Put on safety goggles, glove dominant hand, and lab coat.
2. Use the magnet on each mineral. *Magnetite is the only magnetic mineral.*
3. Put magnetite to the side.
4. Put one of each of the remaining minerals in a cup.
5. Submerge* with 5 ml of vinegar.
6. Wait for a couple of minutes and look for bubbles coming from one mineral.
7. *Calcite is the only mineral containing calcium carbonate which reacts with the acidic vinegar to form the bubbles of carbon dioxide.*
8. Put the calcite to the side.
9. Raise hand to show your teacher.
10. Clean table.

**Submerge: descend below the surface (usually referring to the surface of water)*

LAB SHEET

Lunar Lander Design
Challenge/Budget



DIRECTIONS: Read all of the “Steps for Success” and raise your hands if you have any questions before you begin.

OBJECTIVE: You and your partner will create a “Lunar Lander” designed to transport two astronauts safely to the moon. Your module must keep the astronauts in tact and must be able to land on a surface that is 30 cm by 30 cm. The lander has a budget. *Follow it carefully.*

RESTRICTIONS:

1. You may only use the materials provided.
2. You must stick to your budget. (If you break an item, it will be deducted from your final budget.)
3. Lander must land in between two craters. The space measures 30 cm by 30 cm.
4. Astronauts must arrive on the moon safely (no loss or damage).

STEPS FOR SUCCESS:

1. Plan/sketch/design your lunar lander in the blank space below.

2. Budget using the table below:

Item (max)	Cost per unit	Number of Units	Total
Transport vehicle	provided	1	
Coffee filters (5)	2		
Straws (3)	5		
Popsicle Sticks (4)	4		
String/10 cm (3)	3		
20 cm x 20 cm Tin foil sheet (3)	9		
21.5 cm x 28 cm Paper (3)	11		
Clothespin (1)	13		
5 cm x 5 cm Fabric (1)	21		
Rubber band (2)	7		
Paper Clip (3)	3		
Toothpicks (4)	2		
TOTAL	_____	_____	
BUDGET	_____	_____	\$160
	_____	(subtract your total) _____	
SURPLUS	_____	_____	

3. Begin construction of your prototype.
4. Test (see your teacher for scheduling use of test launch site)
5. Redesign or head for your lunar landing!!!!!!!!!!



DIRECTIONS: Read all of the “Steps for Success” and raise your hands if you have any questions before you begin.

STEPS FOR SUCCESS:

1. Put on safety goggles.
 2. Wind the free end of one string around your index finger a few times. Wind the other string around the index finger on your other hand.
 3. Place your index fingers (with hanger assembly attached) gently on the small flap of skin just in front of your ears, closing off the ear canal without putting your fingers into your ears.
 4. Allow your assembly to swing freely from your two fingers.
 5. Swing the hanger so that it bangs lightly against something hard, like the edge of the periodic table, and then let the hanger hang free.
 6. As the hanger vibrates, you should hear the resulting sound ring through the strings like chimes.
 7. What’s happening?
 - a. Although most of the sounds we hear are transmitted through the air, air is not the only carrier of sound waves—nor is it the best. When something vibrates, the strength of the vibration and the length of time the vibrations continue can vary quite a bit, depending on the materials involved. Hit a piece of wood with a stick and the sound lasts for just an instant. Hit a metal gong with the same stick, and the sound may continue for many seconds. Water is another good transmitter of sound.
- *Other activities: Create a Chladni plate, play different sounds and measure with a decibel meter, experiment with Chrome Music Lab <https://musiclab.chromeexperiments.com/>*

LAB SHEET

Sound Energy/ Vibrations
No safety equipment needed

DIRECTIONS: Read all of the “Steps for Success” and raise your hands if you have any questions before you begin.

STEPS FOR SUCCESS:

1. Fill pipe $\frac{1}{2}$ way to the top with water (PVC works best).



2. Strike a tuning fork and hold it so that its tines.
3. While you hold the vibrating fork just above the end of the pipe, slide the pipe up and down in the cylinder until you find a place where the sound is louder.
4. As the fork continues to vibrate (strike it again as needed), move the pipe upward to find other loud spots.
5. Repeat the procedure with tuning forks of different frequencies and compare results.
6. Chart on a graph what each strike results.
7. What's happening?
 - a. As the tuning fork bends outward in its vibration, it squeezes together the air molecules in its path. These molecules, in turn, squeeze the molecules next to them, and so on. In a sort of domino effect, a pulse of compression (a sound wave) travels down into the tube. The compression wave reflects off the surface of the water within the tube and then travels back up the tube.
8. Research sound waves.

Sound Energy/ Vibrations

No safety equipment necessary

DIRECTIONS: Read all of the “Steps for Success” and raise your hands if you have any questions before you begin.

STEPS FOR SUCCESS:

1. Stand with one person on each end of the slinky. (Do not pull too tight. Allow slinky to droop a bit.)
2. Both send a wave at the same time allowing the wave to meet in the middle. *What do you observe?*
3. Repeat a few times.
4. One person stands still holding the slinky stationary.
5. The other person will send a wave. *What do you observe?*
6. Switch roles. The other person will stand still holding their end still. While the other makes a wave. *What do you observe? How was your result different from what happened when you both made waves?*
7. What is happening?
 - a. Waves are a wiggle in space cause by a vibration or disturbance. They have the ability to carry energy from one location to another. How frequently a wave or vibration occurs during a span of time, determines the waves frequency. Frequency is the number of waves per unit time. The unit for frequency if a Hertz (1/second).Waves are characterized by several distinct behaviors. One behavior is interference. Wave will combine with each other, causing an interference. Brainstorm some types of interference with your group.
 - b. Research and practice calculating frequency.

DIRECTIONS: Today you will explore with soluble and insoluble materials in various mediums.

STEPS FOR SUCCESS:

1. *Although they are similar in appearance, salt and sugar do not share similar characteristics when it comes to solubility. In this activity, you will investigate if salt and sugar are soluble or insoluble in two different solvents: water and vegetable oil.*

2. *Hypothesis:*

Do you think salt and sugar will behave in the same way when dissolved in water and oil? Why or why not?

3. *In the space below, write down what steps you would take to solve the problem and complete this lab. Using the following:*

- 4 cups
- spoons
- 4 cups with 50 ml of water in each
- 4 cups with 50 ml of vegetable oil in each
- 2 cups with 10 ml of salt in each
- 2 cups with 10 ml of sugar in each

1. _____

2. _____

3. _____

4. _____

5. _____

Container	Solute	Solvent	Observation
A			
B			
C			
D			

Now use a spreadsheet to create a digital chart to compare your observations to those of your classmates.

Terms to Know:

Insoluble: canNOT be dissolved

Soluble: can be dissolved

Solvent: the medium in which you are trying to dissolve a substance (i.e. water or oil)

Solute: the substance you are trying to break down/dissolve (i.e. salt or sugar)



LAB SHEET

Circulatory/EDC/Tech

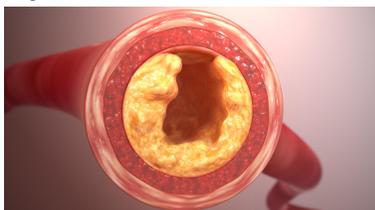


DIRECTIONS: Today you will design a better way to unclog arteries using the tools provided. Read all of the “Steps for Success” and raise your hands if you have any questions before you begin. Put on your safety equipment.

STEPS FOR SUCCESS:

1. Put on safety equipment.
2. Sketch out a plan on scratch paper for how you are going to unclog the arterial wall using only the tools provided.
 - a. Straw
 - b. Toothpicks
 - c. Syringe
 - d. Forceps
 - e. Flash light
3. REMEMBER: the arterial wall is very delicate, so do not scratch or tear
4. Once you have agreed as a team on your plan, you may begin.
5. Check with your teacher when you are done.

**Clogged artery models were created by cutting a pool noodle (artery) into 6 in. long pieces and coating the inner hole with hot glue (plaque) and then allowed to dry and harden until a small opening remained. Much like the illustration below:*



Area/Graphic Design

No safety equipment required

DIRECTIONS: Today you will design your dream classroom using Google Drawing. Read all of the “Steps for Success” and raise your hands if you have any questions before you begin.

STEPS FOR SUCCESS:

1. Open a browser.
2. Type **Google Drawing** into the address bar and press Enter.
3. If you are prompted to sign in, use the following credentials:

Username: _____ (**you will need to create your own Google account**)

Password: _____

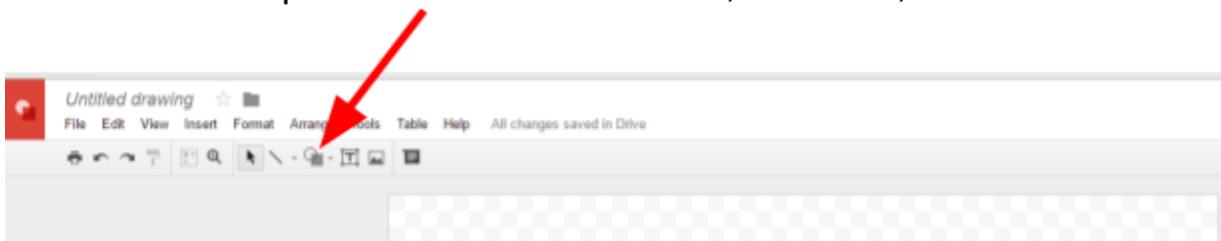
4. Start by naming your dream classroom



Replace *Untitled drawing* with the following:

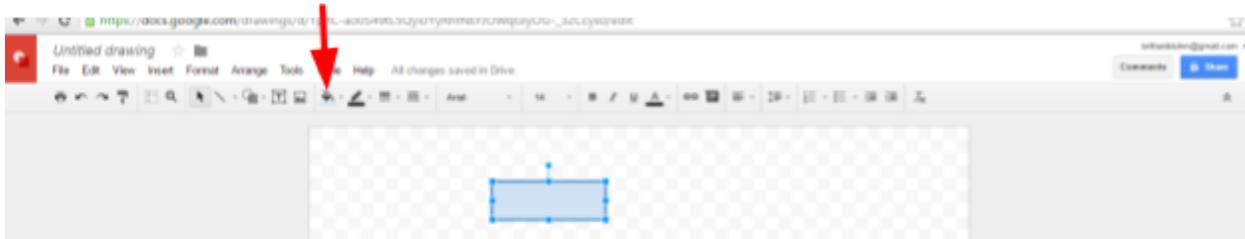
grade/homeroom/design

7. Use the shape button to insert furniture, materials, etc...



- Choose the shape. Click on the drawing space. And drag to the size needed.

- Change the color using the little paint can icon.



8. Requirements:

- All seating must be 9 sq. units
- Must have technology storage space 72 sq. units
- Any tables or desks must be 12 or 42 sq. units
- Must have 2 exits for emergencies that are 8 sq. units
- Label all furniture and exits with a text box



THINK OUTSIDE OF THE TYPICAL CLASSROOM.
In what kind of space would you like to learn?



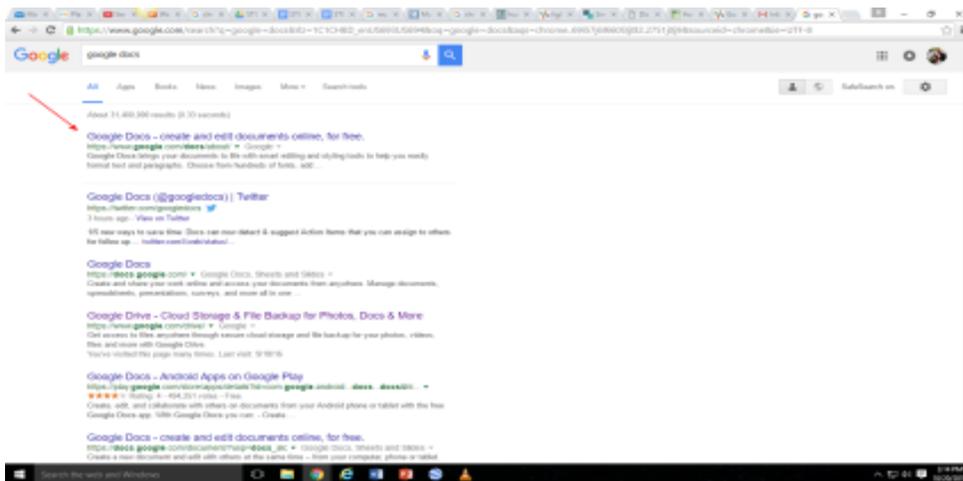
Technology/Weather

No safety equipment required

DIRECTIONS: Today you will design a hurricane preparedness pamphlet for someone who has recently moved to (your state). Read all of the “Steps for Success” and raise your hands if you have any questions before you begin.

STEPS FOR SUCCESS:

1. Open a browser.
2. Type in **Google Docs** into the address bar and press Enter
3. Click on this link:



6. Click on the blue button in the middle of the page that says

Go to Google Docs

7. If you are prompted to sign in, use the following credentials:

Username: _____ (you will need to create your own Google account)

Password: _____

8. Click on **Brochure** or **Project Proposal** (you choose)

9. At the top left you may click where it says **Brochure** or **Project Proposal** to rename your file. Here’s how to name it:

Grade/Homeroom/GroupMembersNames

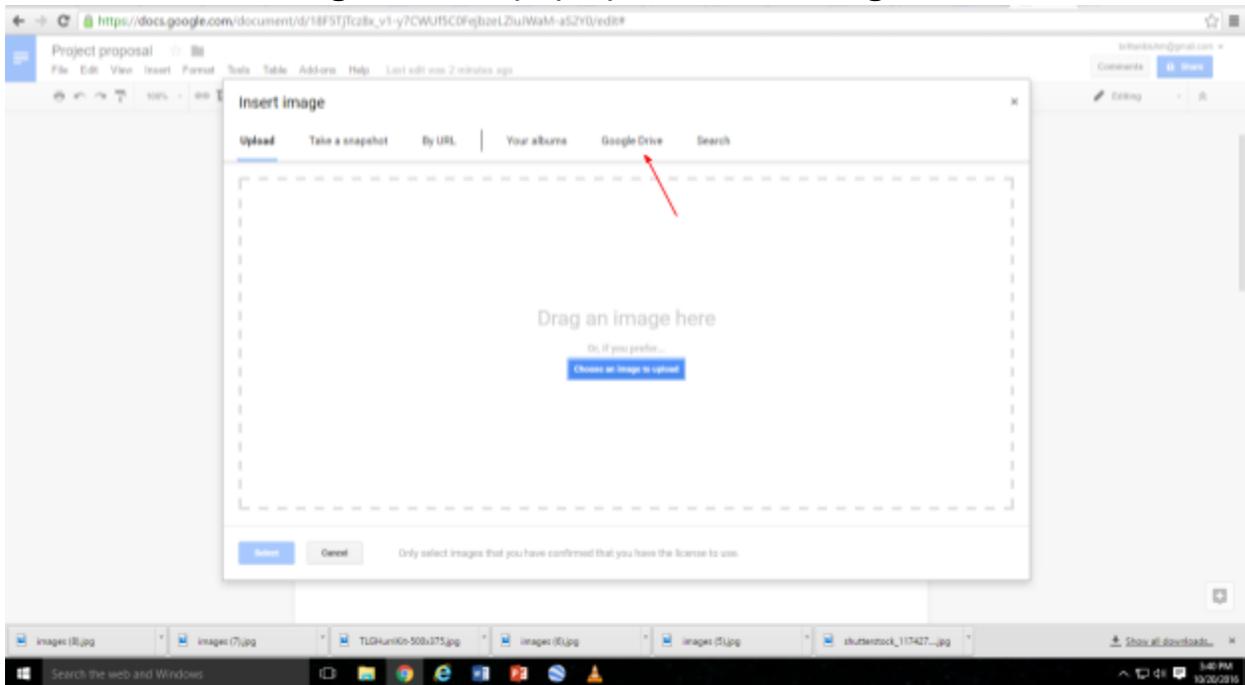
10. You will have to change the subtitles to match what content you add

11. Things to include:

- All group member's names
- Homeroom
- Grade level
- Title of your pamphlet
- A sentence or two about why hurricane preparedness is essential
- Hurricane supplies anyone should purchase
- How to secure their home from the elements
- Extra precautions they may not have considered

12. To add images:

- Click on the existing image you want to replace.
- Click on **Insert** at the toolbar at the top
- Click on **Image**
- An **Insert Image** box will pop up. Click on **Google Drive**



- Click on the **Severe Weather Images** folder
- Select an image to add

13. Proofread to be sure you included everything.

14. Let your teacher know when you are ready to print!

LAB SHEET

Mars Module Design Challenge




DIRECTIONS: Read all of the “Steps for Success” and raise your hands if you have any questions before you begin.

OBJECTIVE: You and your partner will create a “Mars Module” designed to transport cargo (seeds) for the Mars Garden. Your module must keep the cargo in tact and must be able to land on a surface that is 30 cm in diameter. The module has a budget. *Follow it carefully.*

RESTRICTIONS:

1. You may only use the materials provided.
2. You must stick to your budget. (If you break an item, it will be deducted from your final budget.)
3. Module must land in a circular landing pad that measures 30 cm in diameter.
4. Cargo must arrive on Mars surface safely (no loss or damage).

STEPS FOR SUCCESS:

1. Plan/sketch/design your module in the blank space below.

2. Budget using the table below (amounts allowed):

Item (max)	Cost per unit	Number of Units	Total
Transport vehicle	provided	1	
Coffee filters (5)	23.8		
Straws (3)	5.2		
Popsicle Sticks (4)	6.4		
String/10 cm (3)	2.3		
20 cm x 20 cm Tin foil sheet (3)	9.9		
21.5 cm x 28 cm Paper (3)	17.6		
Clothespin (1)	19.5		
5 cm x 5 cm Fabric (1)	42.6		
Rubber band (2)	7.3		
Paper Clip (3)	2.3		
Toothpicks (4)	1.7		
TOTAL	_____	_____	
BUDGET	_____	_____	\$200 MILLION
	_____	(subtract your total) _____	
SURPLUS	_____	_____	

3. Begin construction of your prototype.
4. Test (see your teacher for scheduling use of test launch site)
5. Redesign or go to MARS!!!!!!!!!!

LAB SHEET

Cartesian coordinates/design

No safety equipment required

DIRECTIONS: You are designing a Cartesian board game to play with your family and friends. Read all of the “Steps for Success” and raise your hands if you have any questions before you begin. **Remember the board for your game is a Cartesian plane.*

STEPS FOR SUCCESS:

1. What kind of theme should it have? (ocean, interplanetary, etc...)

2. What kind of pieces will you need? (spinner, cards, dice, etc...)

3. How many players can play? _____

4. Who will start the game? _____

5. How will you know who has won (objective)?

6. What are the steps to playing the game?

1. _____

2. _____

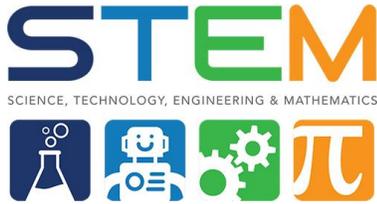
3. _____

4. _____

5. _____

6. _____

7. On the bottom of this page write your team member's first names. Then work as a team to sketch the design.



LAB SHEET

Ratios/Metric
Measurement/Water Cycle



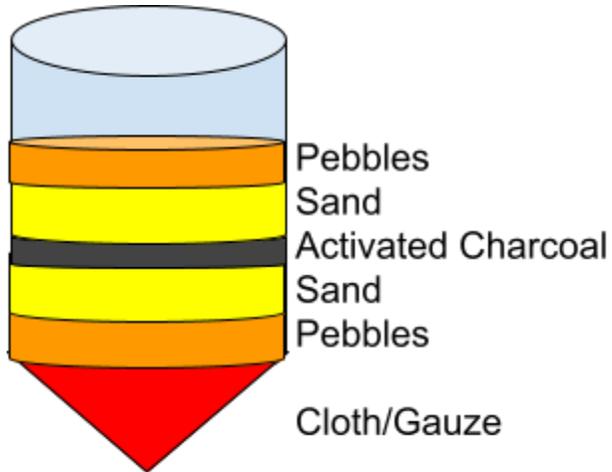
DIRECTIONS: Today you are creating a water filtration system using materials only available in third world countries. Read all of the “Steps for Success” and raise your hands if you have any questions before you begin. Put on your safety equipment.

STEPS FOR SUCCESS:

1. Turn the bottle upside down (with the cap side down).
2. Layer an 8 x 8 cm long piece of cloth/gauze inside the bottle over the cap side.
3. Pour layers of materials into the bottle beginning with 20 ml of pebbles.
4. Pack tightly.
5. Next, gentle pour 25 ml of sand careful to not mix with the pebbles as much as possible.
6. Now, gently pour 10 ml of activated charcoal in the bottle.
7. Next, gentle pour 25 ml of sand.

8. Finally, add a layer of 15 ml of pebbles.

9. Desired result



10. Pour 100 ml of water in the bottle.

11. Catch the filtered water in a cup.

12. Pour the filtered water into a clean beaker and run it through the filter again.

13. Repeat 3 or 4 times.

14. For your water to be safe to drink, you must boil it at 100°C for at least 1 minute.

STEM LAB SHEET

SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS



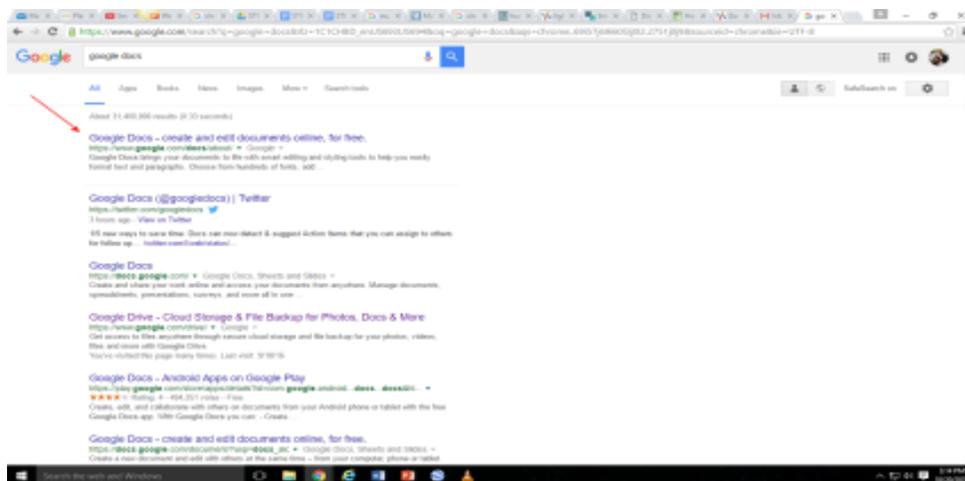
Technology/Spheres

No safety equipment required

DIRECTIONS: Today you will design a resume for a sphere. Be sure to share your sphere's (Biosphere, Hydrosphere, Geosphere, or Atmosphere) qualifications. Why is it best for the job "Top Sphere"? Read all of the "Steps for Success" and raise your hands if you have any questions before you begin.

STEPS FOR SUCCESS:

1. Open a browser.
2. Type **Google Docs** in the address bar and press Enter.
3. Click on this link:



6. Click on the blue button in the middle of the page that says

Go to Google Docs

7. If you are prompted to sign in, use the following credentials:

Username: _____ (you will need to create your own Google account)

Password: _____

8. Click on **Resume** (you choose which one)

9. At the top left you may click where it says **Resume** to rename your file.

Here's how to name it:

Grade/Homeroom/GroupMembersNames

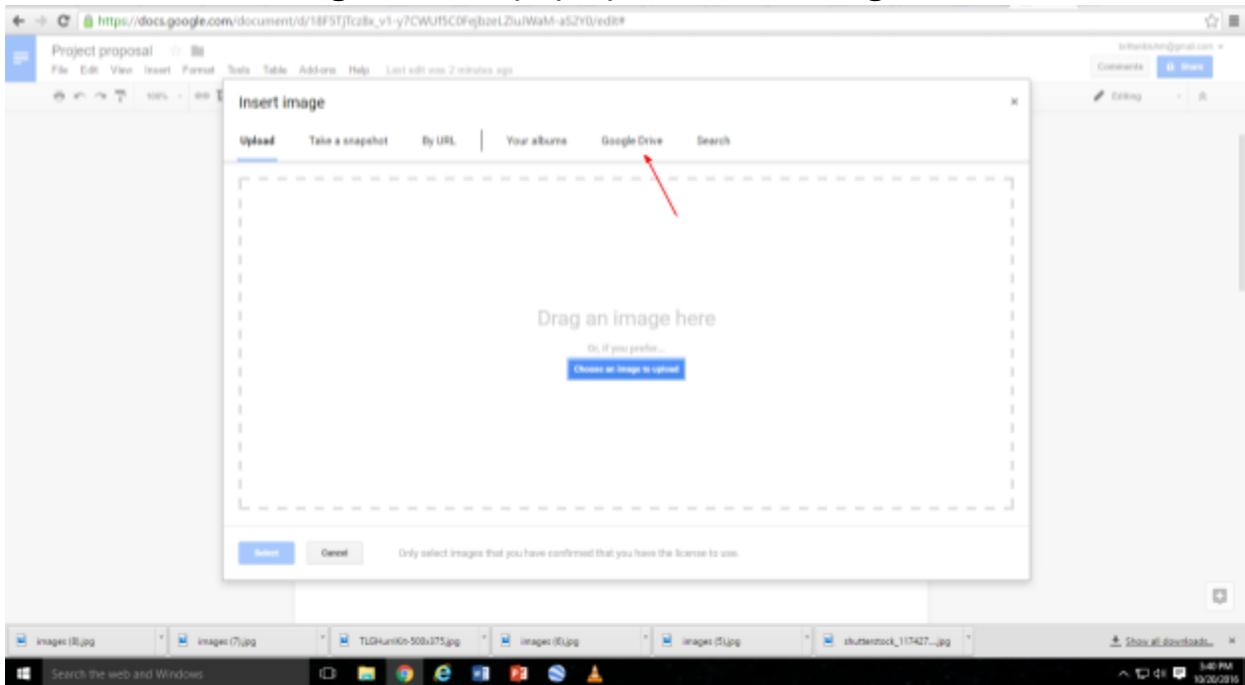
10. You will have to change the subtitles to match what content you add

11. Things to include:

- All group member's names
- Homeroom
- Grade level
- Title of your sphere
- A sentence or two about what characteristics make up your sphere
- What makes your sphere different from other spheres
- How does your sphere work well with others
- Why is your sphere essential to life

12. To add images:

- Click on the existing image you want to replace.
- Click on **Insert** at the toolbar at the top
- Click on **Image**
- An **Insert Image** box will pop up. Click on **Google Drive**



- Click on the **Spheres** folder
- Select an image to add

13. Proofread to be sure you included everything.

14. Let your teacher know when you are ready to print!



- Hour of Code: Coding lessons for students of **all ages** <https://hourofcode.com/us>
- Consider starting a chicken coop or hatchery on school grounds.
- Start a school garden and chart the progress.
- Have students engage in environmental "labs" tracking water quality in the area, animal or plant species monitoring, etc...
- Is construction taking place nearby? Have students engage in an ongoing environmental impact study.
- Start a recycling project **school wide**. Each grade level could be in charge of a different aspect of recycling, reduction, research, etc...
- Partner with a local wildlife, parks and recreation, or other community agency for projects (i.e. water quality testing, fishery monitoring, forestry protection projects, etc...)
- Take nature walks and monitor variances in the local ecosystem.