

1. Plunging into Science!

Purpose: To *identify* and *analyze* the **variables** found in a **scientific investigation**, scenario, or environment.

Instructions: Identify experimental design information for the following scenarios, beginning with the plunger “Stool Hang Time” lab.



Procedure:

1. Using Plunger 1, have one group member press the plunger down onto the lab stool.
2. Once the plunger is secured, have a time-keeper monitor the clock as the plunger handler lifts the stool off the ground!
3. Repeat for all three lab members that are not the time keeper.
4. Record data for Plunger 1 in Data Table 1 after each trial.
5. Repeat Steps 1-4 using Plunger 2.

Data:

Data Table 1. Stool hang time for plunger 1 and plunger 2				
Plunger	Student 1 Time (sec)	Student 2 Time (sec)	Student 3 Time (sec)	Average
1				
2				

SS = _____

CT =(CT contains SS!) _____

MV= _____

ET = _____

RV = _____

(ET Contains SS & MV!)

CV1 = _____

UCV1 = _____

CV2 = _____

UCV2 = _____

Question: How will ... (verb?)... **Manipulated Variable Study Subject.. (either order) affect the Responding Variable ?**

Prediction/Hypothesis IF (ss/mv)_____

Then (et-predict)_____

Compared to (ct)_____

Because (ss,mv,rv & why)_____

Therefore_____



2. The Hot and Cold 2 Liter bottle Scenario

In this exciting experiment students decided to investigate if cooling down the temperature of a 2 Liter bottle affected the air pressure inside the 2 Liter bottle. Then the students will check their results by heating the 2L bottle.

Here's the scenario:

- Student teams have two sealed 2 Liter bottles. Both are at room temperature.
- In the experiment one 2 Liter bottle **remains** at room temperature.
- The students pour **cold water** over the other 2 Liter bottle for 2 minutes.

Afterwards the students squeeze the two bottles and compare the air pressure in the cooled 2 liter bottle to the room temperature 2 liter bottle by giving each bottle a “squeeze test”. After the trials were complete, all data was recorded in the class data table for further analysis.

During the trial students notice that some of the bottles are colored green, some are clear in color. The room air temperature remained steady at 26°C throughout the experiment.

Data Table 1. Effect of temperature on bottle pressure				
Bottle Temp.	Trial 1	Trial 2	Trial 3	Average
Room Temp.				
Hot				
Cold				

SS = _____

CT =(CT contains SS!) _____

MV= _____

ET = _____

RV = _____

(ET Contains SS & MV!)

CV1 = _____

UCV1 = _____

CV2 = _____

UCV2 = _____

Question: How will ... (verb?)... *Manipulated Variable Study Subject..* (either order) affect the Responding Variable ?

Prediction/Hypothesis IF (ss/mv) _____

Then (et-predict) _____

Compared to (ct) _____

Because (ss,mv,rv & why) _____

Therefore _____

3. Pellegra in the South

In Dr. Goldberger’s effort in the South to solve the pellagra problem, the good doctor chose to test his hypothesis on prisoners. Dr. Goldberger, with permission of the Governor, isolated 11 prisoner volunteers to test his hypothesis.

- The prisoners were all kept in the same building.
- The building’s floors and walls were scrubbed regularly.
- The prisoner’s clothes were new and washed frequently.
- Insect nets were placed on the screens to keep the insects out.
- All prisoners were fed a “traditional Southern diet of cornbread, fatback and syrup.
- Over time 7 of the 11 prisoners developed pellagra.
- All the other the prisoners at the prison were fed a balanced diet.



SS = _____

CT =(CT contains SS!) _____

MV= _____

ET = _____

RV = _____

(ET Contains SS & MV!)

CV1 = _____

UCV1 = _____

CV2 = _____

UCV2 = _____

Question: How will ... (verb?)... *Manipulated Variable* *Study Subject*.. (either order) affect the *Responding Variable* ?

Prediction/Hypothesis IF (ss/mv)_____

Then (et-predict)_____

Compared to (ct)_____

Because (ss,mv,rv & why)_____

Therefore_____



4. A Clinical Trial

You work for a company that develops medicines. You have developed a medication for severe headaches and have tested it on rats and mice to see if it has any negative effects. The tests on animals showed no harmful effects, even at much higher doses than you plan to use on humans. Now it is time to test the effectiveness of the headache medicine on human volunteers in a clinical trial.

- Half of the volunteers sample a pink drink that contains medicine as one of the ingredients.
- Half of the volunteers sample a pink drink that contains no medicine ingredients.
- Volunteers used cups that are the same type and don't switch cups
- All get drinks from the same batch for the specific type of drink
- All volunteers test at the same time
- All data is computed on one computer

SS = _____

CT =(CT contains SS!) _____

MV= _____

ET = _____

RV = _____

(ET Contains SS & MV!)

CV1 = _____

UCV1 = _____

CV2 = _____

UCV2 = _____

Placebo = _____

Question: How will ... (verb?)... *Manipulated Variable Study Subject..* (either order) affect the Responding Variable ?

Prediction/Hypothesis IF (ss/mv) _____

Then (et-predict) _____

Compared to (ct) _____

Because (ss,mv,rv & why) _____

Therefore _____

Situational Analysis – Student

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Name _____

Period _____



5. The Guinea Pig Scenario

Science Seven students decide to perform the following life science experiment:

The students brought 4 pet healthy guinea pigs into Science class.

- Two female Guinea pigs are placed in two similarly sized cages and were fed a diet of only apples every day for two weeks.
- The two other Guinea pigs are placed in one cage. These Guinea pigs were fed a variety of Guinea pig food for two weeks.
- There are three female Guinea pigs and one male Guinea Pig.
- The mass of food each pair of Guinea pigs was fed each day is the same.
- Both cages are kept in the same place in the lab.
- Water and food are given at various times each day.
- One day the male guinea pig got out of his pen and ate some of the lab’s cat food. He was caught and returned back to his pen immediately after he was located.

The mass of each Guinea pig was measured every day and recorded on a data table. At the end of the trial all data was graphed and analyzed.

SS = _____

CT =(CT contains SS!) _____

MV= _____

ET = _____

RV = _____

(ET Contains SS & MV!)

CV1 = _____

UCV1 = _____

CV2 = _____

UCV2 = _____

Question: How will ... (verb?)... *Manipulated Variable* *Study Subject*.. (either order) affect the *Responding Variable* ?

Prediction/Hypothesis IF (ss/mv)_____

Then (et-predict)_____

Compared to (ct)_____

Because (ss,mv,rv & why)_____

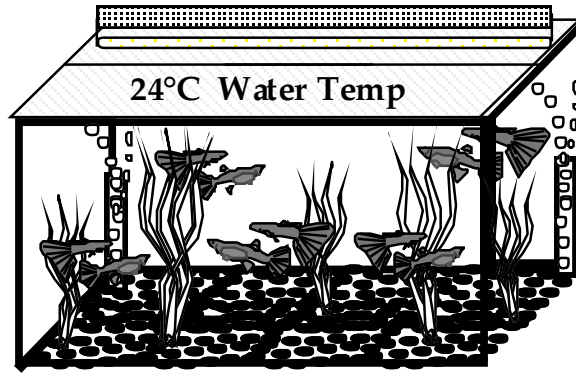
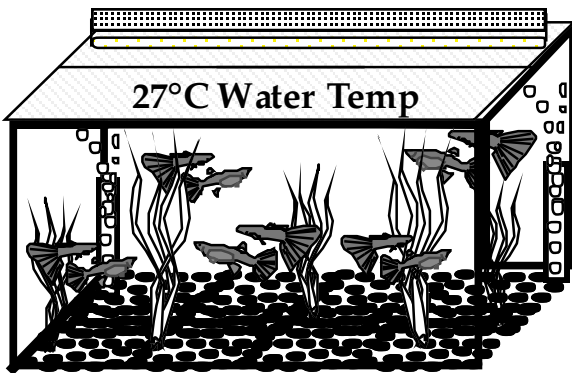
Therefore_____

6. Challenge = Guppies Sex vs. Temperature - In this long-term life science experiment, Science Seven students developed an experiment that could be done in the laboratory.

The experiment's set up is as follows.

- A 20 gallon aquarium was set up in the science laboratory and the water heater temperature was adjusted to keep the average water temperature at 27°C, the best temperature for raising guppies.
- A second 20 gallon aquarium was set up next to the first aquarium and the water heater temperature was lowered to keep the average water temperature at 24°C.
- Both aquariums have the same type of equipment. Each aquarium has the same amount of:

air supply	filtration	gravel
lighting	plants	



A week after the aquariums were set up, 10 Guppies, 5 female and 5 male, were placed into each aquarium. The Guppies in the aquariums are fed the same amount of food each day, but the feeding times varied.

After 30 days, students discovered babies being born in each aquarium. All babies were taken out of the aquariums, put into two separate tanks, and kept there until each baby's gender could be positively determined. The gender ratio (males to females) of the babies was entered in a Data Table.

- Afterwards all the young guppies were returned to their original aquariums.
- Each time baby guppies were discovered, the same procedure was followed.
- Two and a half months into the experiment, power was shut off to the school for 3 days due to a winter snowstorm.

The investigation continued for a total of nine months. Gender ratio data were recorded throughout the period.

SS = _____
MV = _____
RV = _____
CV1 = _____
CV2 = _____

CT =(CT contains SS!) _____
ET = _____
(ET Contains SS & MV!)
UCV1 = _____
UCV2 = _____

Question: _____

Prediction/Hypothesis IF (ss/mv) _____

Then (et-predict) _____

Compared to (ct) _____

Because (ss,mv,rv & why) _____

Therefore _____