Friday schedule + activity schedule

1 Start class right away with the video for the activity.

2 Then show goals.

https://abcnews.go.com/GMA/video/power-drink-placebo-effect-19850208

Would you fall for that?

We'll start class with a short video

AP Stats-Lesson 4.2 Day 2: Would you fall for that?

Would you fall for the placebo effect? Watch this video, then complete the rest of the questions.

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They thought they should be stronger so maybe they tried harder.

AP Stats-Lesson 4.2 Day 2: Would you fall for that?

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Placebo Effect

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Suppose the designer of the experiment wants to use a beverage to test the affect that caffeine can have on heart rate. Here is an initial plan:

1. *measure initial pulse rate*
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3. *measure final pulse rate*

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- There is nothing to compare to
- Sugar might increase pulse rate.
- People know they're getting caffeine so it could be a placebo effect.

3. Go back up to your list in #2 and propose a solution to each problem. Discuss in your group.

4. Design an experiment to test the effect that caffeine has on heart rate.

Diagram:

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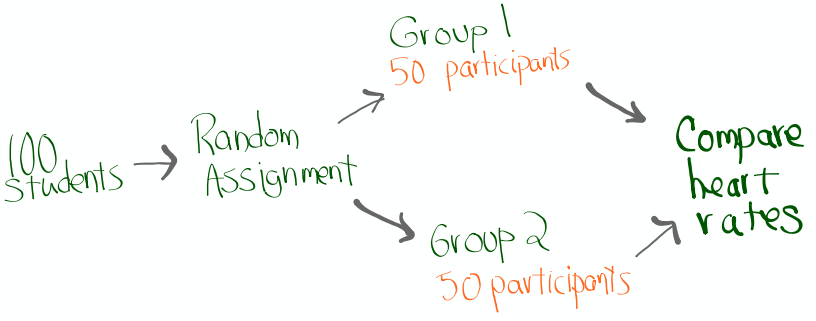
1 Split participants randomly into groups.
2 Give one group coke and the other caffeine-free bever.
3 Compare their change in heart rate.

Diagram:



We solve these problems with **comparison**, **blinding**, **random assignment**, **control**, and **replication**.

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Control Group → There is nothing to compare to

Control other variables → Sugar might increase pulse rate.

Blinding → People know they're getting caffeine so it could be a placebo effect.

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Randomized Design

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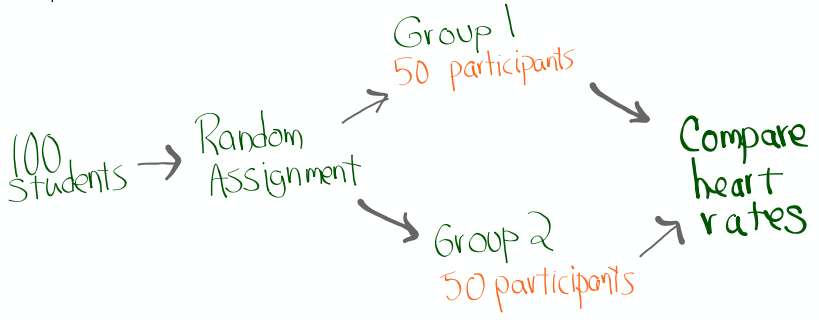

Big Ideas of: Designing Experiments

Control Group: Used to provide baseline data for comparison.

Blinding:

Placebo Effect:

Otherwise, any pulse-raising (or lowering) event that ocurs would be confounded with caffeine.

Question

What should the no caffeine group get? Nothing? Sprite? Caffeine free Coke?

Big Ideas of: Designing Experiments

Control Group: Used to provide baseline data for comparison.

Blinding:

Placebo Effect: When fake treatment work.

Note:

Not all experiments have a control group or use a placebo as long as their is a comparison.

ie. Testing a new drug .... it is usually compared to an existing drug, not a placebo.

ie. You can compare 4 brands of paint w/o a Placebo.

Big Ideas of: Designing Experiments

Control Group: Used to provide baseline data for comparison.

Blinding: When subjects (single blind) and/or experimenters (double blind) who interact are unaware of what treatment was assigned.

Placebo Effect: When fake treatment works.

4 Key Principles of Experiments

1. **Comparison** 2 or more treatments.
2. **Random Assignment** Use a chance process to assign units. Ensures effects of uncontrolled variables are balanced among treatment groups.
3. **Control**
4. **Replication**

We must ALWAYS randomize.
since there will always be other variables we cannot control.

Randomizing guards against what we don't know and prevents from asking "But what about this variable?"

4 Key Principles of Experiments

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4. **Replication**

Note: If an experiment has more than one treatment and the researchers only want to know which treatment is best, a control group (or with a placebo is not necessary)

4 Key Principles of Experiments

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2. **Random Assignment** Use a chance process to assign units. Ensures effects of uncontrolled variables are balanced among treatment groups.
3. **Control** : Keep all other variables besides treatments constant.
4. **Replication** Using enough experimental units to distinguish differences.

Work on problems

1 to 4

Check Your Understanding:

1. **Growing the best corn** (*Control groups*)
A group of AP® Biology students randomly assigned 100 corn seeds to be planted either at a depth of 1.5 inches or a depth of 3 inches. Explain why it was not necessary to include a control group of seeds that were not planted in soil.

The purpose of a control group is to provide a baseline so that the results of a treatment can be compared. In this experiment, there is no need for a control group because the two treatments can be compared. The AP® Biology students are interested in knowing which treatment is more effective when compared to the other treatment.

2. Many utility companies (including EWEB in Eugene) have introduced programs to encourage energy conservation among their customers. An electric company considers placing small digital displays in households to show current electricity use and what the cost would be if this use continued for a month. Will the displays reduce electricity use? One cheaper approach is to give customers a chart and information about monitoring their electricity use from their outside meter. Would this method work almost as well?

The company decides to conduct an experiment using 60 households to compare these two approaches (display, chart) with a group of customers who receive information about energy consumption but no help in monitoring electricity use.

a. Explain why it was important to have a control group that didn't get the display or the chart.

Allows us to show how much electricity customers normally use. (baseline data)

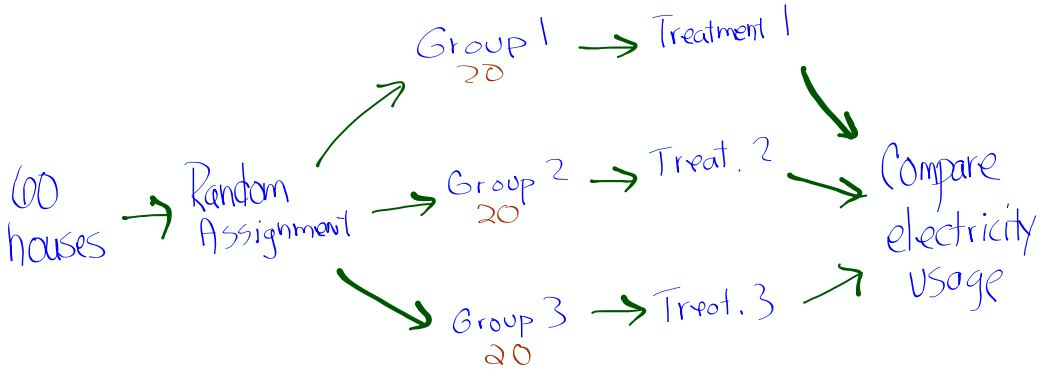
b. Describe how to randomly assign the treatments to the 60 households.

1 Label all households 1 to 60.
2 Use a random number generator to choose 20 distinct numbers between 1 and 60.
3 Assign them to display.
4 Repeat for 20 more numbers ignoring repeats.

c. What is the purpose of randomly assigning treatments in this context?

It creates roughly equivalent groups by balancing other variables.

d. Create an outline, or diagram, showing a **completely randomized design** for the experiment.



3. **The first double-blind experiment** (*Blinding and the placebo effect)*
W. H. R. Rivers is credited with creating the first double-blind experiment in 1907. Rivers was interested in finding out if caffeine has an effect on work output. He quickly discovered the psychological effect on subjects who knew they were receiving a treatment. This led him to create a placebo for each experiment, which looked and tasted just like the caffeine treatment.

Rivers would have a friend prepare the caffeine drinks and the placebo drinks and would then give the drinks to the subjects. A *double-blind experiment* would mean that neither the subjects nor the researcher (Rivers) knew which subjects were given the caffeine drink and which subjects were given the placebo drink.

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If subjects knew they were drinking caffeine, Rivers wouldn't be able to determine whether any improvement in work output was due to the caffeine or to the subjects' expectation of working harder (the placebo effect).

If Rivers knew which subjects received which treatments, he might have treated one group of subjects differently from the other group. This would make it difficult to know if the caffeine was the cause of any improvement in work output.

4. Is it better to learn geometry online or in a class? (*How random assignment works)*

Do students learn geometry better from an online course or in class with a teacher? To find out, a large high school set up an experiment with 500 student volunteers. The school randomly assigned half the students to take the geometry course online, watching videos to inform their learning. The other half took a more traditional course with lectures by a teacher. Describe how you would randomly assign 500 students to each of the two treatments:

(a) Using 500 identical slips of paper

Shuffle the slips of paper and hand out to each student.

Students who get an "On-line" slip will take the Geom. course and students who get "Teacher" will take class taught by teacher.

(b) Using technology

(c) Using Table D

AP EXAM tip

(too long to write!)

4.2.....57, 59, 61, 63