**Required class task:** Description of experimental variables for class projects continued from previous class.

- Yerika Jimenez represented her group where she described the experimental variables for her project. Sanethia Thomas and Elizabeth Matthew are also members of this group. This project has to deal with comic pages.
- Following was Jessica Jones explaining the experimental variables and details of her experiment. Naja Mack and Tiffanie Smith are also members of this group. This project has to deal with flashing icons.
- The next team included France Jackson, Marvin Andujar and Chris Crawford. France explained details of her team’s Brain Computer Interface experiment and also discussed experimental variables as well.
- Dekita Moon described the experimental variables for her experiment relating to perceived attractiveness based on the golden ratio. Alison Nolan was also a member of this project team.

**New Sub-Topic: Confounding Variables**

A confounding variable is a circumstance or characteristic that varies systematically with the independent variable of the experiment in question. Unlike control or random variables, confounding variables are usually problematic in experimental research. Is the effect observed due to the independent variable or to the confounding variable? Researchers must attune to the possible presence of a confounding variable and eliminate it, or consider it in some way. Otherwise, the effects may be incorrectly interpreted.

e.g. consider an experiment seeking to determine if there is an effect of camera distance on human performance using an eye tracker for computer control. In the experiment, camera distance, which is the independent variable, has two levels, near and far. For the near condition, a small camera (A) is mounted on a bracket attached to the user’s eye glasses. For the far condition, an expensive eye tracking system is used with the camera (B) positioned above the system’s display. Here the camera is a confounding variable since it varies systematically across the levels of the independent variable: camera A for the near condition and camera B for the far condition. If the experiment shows a significant effect of camera distance on human performance, there is a possibility that the effect has nothing to do with camera distance. Perhaps the effect is simply the
result of using one camera for the near condition and a different camera for the far condition. The confound is avoided by using the same camera (and same system) in both the near and far conditions. Where there is a near camera (placed on the participants’ glasses) and a far camera placed on a wall.

Confounds tend to show up when testing interfaces. For e.g. learning effect sometimes occur when user’s have to use interface A, B and C where C is the last interface used, in some cases users may complete the task faster on interface C due to possible learning effects. One way to address this is to counterbalance the order of presenting test conditions to participants.

Another confounding effect example could exist in the testing of three algorithms to see which one is fastest. In some cases because of how the experiment has been setup, you get a confounding effect which may be due to lower memory for the last or some of the algorithms that are tested. At the time when the last algorithm was tested, the load on the processor may have been more burdensome due to other tasks running or the time that the processor has been on.

**New Sub-Topic: Task**

There are two main objectives in designing good task.

1) **Representative.** Task need to be representative of their expected usage. A good task is representative of the activities people do with the interface.

2) **Discriminative.** This means that the response in condition one should be different than experiment 2. There needs to be something that is different in the interaction that differentiates the test condition.

You should now notice that designing experiments is a sophisticated art.

This is an example where a task may not be discriminative enough. If there is an experiment to check the faster web search interface (say Google vs. Bing) and the participant is asked to find the birth date of Albert Einstein. Notice that the participant is asked to look for the same person on both interfaces. These tasks are not discriminative enough for the two experiments and there may be a learning effect passed to the second interface testing. One way to fix this is find a similar name that is famous but different from Albert Einstein, such as William Shakespeare. This is a starting point to fixing this issue. This can be sometimes tricky, since the new task must be more or less the same (so the search methods can be compared), but also different enough so that the participant does not benefit from the exposure to the earlier, similar task.
New Sub-Topic: Participant Recruiting

It is very important that participants being tested are representative of the population. Researchers assume that their results apply to people who were not tested.

Two critical things to keep in mind when recruiting:

1) You need to understand who the participants are, as it related to the context of the experiment. For e.g. demographic information, pre survey questions such as if they have used a similar system before etc. e.g. results are unlikely to apply to children if the participants were drawn from a college campus. It is very important where you recruit for your experiment.

2) How many participants to conduct experiments with is very important as well. There is no magic answer for this. However, it is good to do a power analysis to see the N (sample size that you need). A good idea often times is to conduct experiments with as many people as previously published related research.

Usability Testing and conducting experiments are completely different things. People sometimes get this confused.

Sub Topic: Type of Experiment

If each participant is tested on each level, the assignment is within-subjects. Another name for within-subjects is repeated measures since the measurements on each test condition are repeated for each participant. If each participant is tested on only one level, the assignment is called between subjects. For a between-subjects design, a separate group of participants is used for each test condition.

<table>
<thead>
<tr>
<th>Repeated Measurers/Within Subjects (every participant sees all test conditions)</th>
<th>Between Subjects (each participant will see a different condition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eg. Participant</td>
<td>Condition</td>
</tr>
<tr>
<td>1</td>
<td>A, B, C</td>
</tr>
<tr>
<td>2</td>
<td>A, B, C</td>
</tr>
<tr>
<td>3</td>
<td></td>
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<tr>
<td>4</td>
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<td>5</td>
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<td>6</td>
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</table>
There is a tradeoff with choosing your experiment method, for a between-subjects design each participant is tested on only one level of a factor; therefore, more participants are needed to obtain the same number of observations as evident from the table above. For a within-subjects design, each participant is tested on all levels of a factor.

**Required Task:** Sit in your project groups and carefully design all the tasks for your experiment.

Jessica Jones starts the discussion explaining the task that she has designed for her experiment. Jessica worked with her teammates Naja Mack and Tiffanie Smith to identify these tasks.

Next was Yunhao Wan’s experiment focused on identifying a specific sound or the count of a specific sound from an audio clip.

Andrew Robb represented his group and explained the task associated with his Virtual Reality experiment. Zsolt Szabo and Stephanie Carnell are also members of Andrew’s team and gave pertinent input when necessary.

Note: Some supporting notes taken from required class textbook (Human-Computer Interaction, An Empirical Research Perspective by I. Scott Mackenzie).