Lab 1 – Methods: Teaching Notes

Overview

The first lab of the semester is tricky for several reasons. We need to present logistics, course overview and expectations, start building community within the lab section, and accomplish some effective lab work. This lab's focus — Methods — and the next two labs are building the fundamental toolkit and are not as glitzy and captivating as later labs. The students arrive with different levels of knowledge, and we need to discover what's already known, undo misconceptions, and start building a shared base of knowledge across the section.

Suggested reading

We cannot assign students reading in preparation for our lab, but it is wise to read the textbook and the slides from lecture, for your own teaching preparation. The textbook will support and underscore the teaching we present in labs (and not the other way around). Please follow the course syllabus for assigned readings.

Goals

To start the labs off on the right foot, to teach fundamental research skills. to build community and strengthen group process skills.. To set expectations for the 9 labs, and the learning process. To complete a student-centered basic research project.

Learning objectives

Coursework

At the completion of this lab, students will be able to

- ✓ define and use the steps in creating and running a study
- ✓ develop relatively solid and testable hypothesis
- ✓ operationalize variables
- ✓ identify and refine independent and dependent variables
- ✓ define, assess, and apply random assignment to condition
- ✓ recall and use these basic steps and build on them in upcoming labs
- ✓ experience the exploratory experiential collaborative learning environment of lab

Framework

After our discussion of syllabus, process, and lab guidelines, students will be able to

- ✓ understand expectations of the course
- ✓ assess the workload of the lab component of Psych 101
- ✓ understand what they will be graded on in lab and when papers are due
- ✓ know who to contact and how best to reach the teaching team members

Materials: what you'll need for this lab

- M&Ms and Skittles
- Poker chip box (for random sampling exercise)
- Word lists for memory exercise (attached in this file, print copies for your groups)
- Extra printed worksheets for students who did not arrive with their copy; or check access to the worksheets on our lab computers (if you are going green)
- Extra copies of the lab syllabus or access to the lab syllabus online
- Print out of your student and photos of your section (from Blackboard)

Room set-up

- Regular discussion set-up
- Arrive early enough to retrieve the M&Ms/Skittles from their hiding place (in the cabinet underneath the laser printer) **before** the students arrive...
- If you are going to use the computers, plan time to check set up

Teaching components

These are the basic building blocks that we need to deliver. The first 20 minutes of the first hour are your prime time: studies show significantly higher retention rates during this segment. Design your teaching so you get the best return on learning out of this prime time.

As you create your lesson plan, you can choose the order of delivery. It is always a good idea to prepare more teaching segments than you think you will need; easier to omit than to create on the spot.

This is an overview of what is in the teaching notes. You can see a click-through menu in Word by going to View → Document Map and a left hand column will appear with the major headings.

Framework (~1 hr, in 2 time segments)

- Introductions / icebreakers
- Syllabus and guidelines

Methods (~2 hr, in 2 time segments)

1. Research design steps
    1) Observe (gather information, research literature)
    2) Develop hypotheses (design the study)
    3) Test hypothesis (run the study)
    4) Build a theory (organize data and analyze statistics)
    5) Draw conclusions
2. Coming to terms (operationally)
3. Researching with chocolate

<< Syllabus can be reviewed here as a distractor >>

4. What went wrong?

Word List (for memory exercise in Researching with Chocolate)
Definitions (for Coming to Terms segment)

Primacy and recency effects

The first and last parts of your lab will impact your students the most. Plan and practice the beginning of your lab, and the end of the lab. The first and last labs will also most impact their impressions of the labs overall. Our last lab is a fun memorable lab (lie detector tests), and this first one can be also.

Three ways to answer a question

Remember that there are at least three ways to answer or field a question. You can throw the question open to the class, you can counter-query (if you think the questioner might be able to discover the answer, or if you need clarification), or you can just answer it. Especially as you begin teaching, this is useful to remember. With any question, you have a choice about how you will logistically answer it, and in time you'll have good instincts in knowing which choice to make for the maximum benefit to the learning experience.

Framework

Introductions and icebreakers

Icebreakers can be effective when their focus is related to either the goals of the specific class or of the course, or when they add content or information that is relevant. Like Chekhov's gun, it is important if you introduce something in the first act, it is useful by the third act, or the critics will be fierce. Icebreakers that do not work (and have given icebreakers a rather sullied reputation) usually do not have relevance to the design of the workshop or course.

Purpose

Icebreakers can serve several purposes. Your lab as a group is just forming; a solid and well-designed icebreaker can jump start group cohesion. Here is one quick overview of group dynamics.

Simple stages are:

1. forming (orientation, introductions, learning the environment)
2. norming (learning the guidelines and expectations, organizing to get work done)
3. storming (learning how conflict is resolved, may include testing the limits and renegotiating the norms)
4. performing (producing, group cohesion, working well together, collaboration)

Part of the forming stage for group members is finding their place and securing more context about the other members. Icebreakers can also help all participants "arrive" to the room, and be present. They can offer a non-gradable and creative introduction to either the content, participants, or both.

Note that the cycle of group process gets invoked whenever membership changes. As new members join even an established group, the cycle begins again, usually more briefly but the stages can be observed as the group brings new members up to speed. (The syllabus and your guidelines for your lab will be helpful in developing the norming stage.)

Review the goals for this course and for this specific lab, and see what kind of icebreaker you might design that relates to either methods or a future lab focus.

Possible icebreaker: "on your feet (no names)"

For five labs (4, 5, 6, 8, 9), the subject pool for the experiments will be the students in each lab. One possible icebreaker (to be run _before_ introductions) would be to explore what kinds of factors they might want to know about this subject pool, prior to running an experiment—and offer some potential applications of these factors.

You can tease out of the students themselves—as a whole group, or in smaller groups—several factors that might be useful. Some examples:

- Knowing the height of participants could be useful in a study that explores the correlation between height and success in business. (Height is positively correlated to executive salaries)
- Birth months: Can correlate to success as a professional hockey player (see Malcolm Gladwell's *Outliers*)
- Birth order: Do first-borns tend to ask more questions in class?
- Gender: Do women students defer to men students when speaking in class?
- Home residence: Are students at Princeton more susceptible to Seasonal Affective Disorder depending on where their most recent home was?
- Residential Colleges: Are Students from Rocky perennially later to appointments than those from Wilson?
- Other chosen factors chosen include: Eye color, foreign travel, number of languages spoken, class year, majors, number of current pets.

Have the students pick 2-4 parameters, and then group the students physically into these groups (without name/college introductions yet). Get them on their feet. If you are using the birthday, height, home residence, allow them to order themselves. Give them a moment to look at the grouping, take in this awareness and their own place in this order.

When this is accomplished, have them sit (perhaps in one of the groupings) and THEN give their personal introduction.

When I was teaching in Italy, I used this "on your feet (no names)" icebreaker with interesting success. I used a control group of a normal "give your name, college, purpose in taking this course" the same semester. And, I found that the class that learned unusual things about each other _prior_ to name, rank, and serial number kinds of information, bonded much more strongly as a class.

Should you choose to try this approach, please report back in our Friday meeting. You can also ask your students to compare this on-your-feet icebreaker to a standard stay-sitting-tell-us-who-you-are.

Teacher videos

This is the Candid Camera video of the high school girls interacting with the handsome teacher. It is effective as an opening for the lab, since the students can relate directly to the scenario. It allows you to begin exploring immediately the principles in designing a study.

It is important to use "Benefit Language" when introducing these videos. Let the students know 'what's in it for them' to watch this. How it fits into the course.

There are several ways to introduce the video. You can begin the discussion asking what they expect. You can give them several of the elements in the video, have them design an experiment—create a hypothesis, identify things to observe, and then run the video. Or, you can just show the video and then get a discussion going:

1. Observe (gather information, research literature)

   What's going on generally? Specific verbal and nonverbal behaviors and what triggers them (e.g. they don't laugh until he leaves). What did they see? Have students describe their observations.

2. Operationalize ATTRACTIVENESS. Go around the room and have each person give a statement or observation that could be used towards operationalizing attractiveness, or ATTRACTION.

3. Design the study (develop hypotheses, operationalize terms, details of procedure, determine population, etc.). Have class come up with hypotheses to predict what's going on.

4. Prediction: Use those hypotheses to make predictions about whether the effect would generalize to other circumstances (e.g., much younger students, much older students, only one student instead of two, male students with a female teacher...)

5. Second video... Run the study (test hypothesis). The class has now predicted what they expect the boys' population will do in a reserve situation. Run the second video to test the hypothesis.

6. Draw conclusions (interpret findings, identify flaws in study, suggest further work). Analyze the hypothesis… How can this apply to other studies? Can you extend the assumption of similar gender responses to other situations? Why or why now? Give examples of studies and have the class hypothesize, extrapolating from these videos.

Teaching components

Research design steps

Here are the design steps we want to drill on. The phrases in parenthesis for numbers 2 through 4 are used as headings in later lab worksheets. So coming to consensus on these terms will be helpful pedagogically. We can use the steps in most of the lab structures and on worksheets as well.

1. Observe (gather information, research literature)
2. Design the study (develop hypotheses, operationalize terms, details of procedure, determine population, etc.)
3. Run the study (test hypothesis)
4. Analyze results (organize, code, and tally data, run statistical analysis)
5. Draw conclusions (interpret findings, identify flaws in study, suggest further work)

Students arrive with prior knowledge and prior misconceptions. Design an interaction (whole group or small group) to pull forth these steps and begin defining process.

One way to shape the discussion, which runs parallel to the textbook examples, is to draw on television shows like "House," "Lie to Me" or "The Mentalist." Facts are gathered, a hypothesis created, then tested, you get the drift. Television and movie watchers have witnessed non-rigorous versions of research design. Consider creating a list of true and pseudo hypotheses, and checking with the class, a la "Deal or No Deal", their reaction to Hypothesis or No Hypothesis. You can leave this open-ended and return after introducing the importance of rigor in definitions.

Coming to terms – Operationalization

In this segment, guide the class to define terms—specifically, terms that can be tested. This is one of the most important concepts for all of the labs, so make sure they have it down.

Defining terms

You might want to start with a concrete example. For instance, bring in an apple, and have them determine how to define a "good apple." Working with a concrete example first may help lead into more theoretical definitions. A concrete example will be helpful after operationalizing ATTRACTIVENESS.

Start with 5 terms, and break your group into 5 sections. Have each group create operational definitions for one term that is specific enough that the researcher could actually use them for research. Then have the other groups challenge, refute, question the definitions. Here is a list of terms used previously:

- **Humor ***
- **Conformity ***
- **Gullibility ***
- **Altruism ***
- **Integrity**

***** We have research papers for these 4 terms with operationalized definitions. The papers are posted in the teaching team area on Blackboard. If you use these terms, then print the papers out, and share the definitions with the whole class AFTER the discussion. You can put the definitions on your slides. This will highlight the importance of the context of an operationalized term.

Discuss the definitions that the students give, and use this as an entry into the idea of an operational definition. We want you to be able to challenge almost all definitions offered, to show how rigorous a good operational definition needs to be. It is wise to come prepared with your own.

There are two ways to evaluate an operational definition (good to have these on PPTs):

1. Is the definition precise? Could any researcher who is given that operational definition measure it in the same way? (For example, if humor is defined as how much a person laughs, one researcher could measure by noise volume and another by length of laughter.)
2. Does the definition focus on what you want to measure? (i.e., is it valid?) For example, an extreme example would be, if humor is measured as a person's height in inches, this is precise but it is a terrible definition of humor and not useful to the study. A subtler example would be, if humor is defined as the percentage of the room that engages in any form of laughter. The laughter could be due to discomfort at the content of the joke, or any other number of things—remember the cute teacher video example.

It is useful to work with the whole group on one or two terms (good apple, happiness, for example). Then, using small groups, assign each group to a term. Next, have the teams present and receive challenge questions—either as a whole group, or have the teams challenge each other, whichever process seems best for your group process.

See the last page of this teaching notes file, for definitions of some terms from the textbooks. As a teaching team, let's identify the key must-know terms, and the nice-to-know terms for this lab. Then lead the students to define the terms, and use their definitions during the rest of lab.

Researching with chocolate

In this segment, the students will create a lab experiment using the paragraph below (also appear on their worksheets, with additional questions for each step).

People often feel that a small sugary snack before some test of their performance improves their ability to concentrate or to remember information. Today's experiment will examine this premise. Specifically, we'll look at whether eating chocolate candy is associated with a gain in memory performance.

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1. Observe (gather information, research literature)
2. Design the study (develop hypotheses, operationalize terms, details of procedure, determine population, etc.)
3. Run the study (test hypothesis)
4. Analyze results (organize, code, and tally data, run statistical analysis)

5. Draw conclusions (interpret findings, identify flaws in study, suggest further work)

Step 1: Observe (gather information, research literature)

Step 2: Design the study (develop hypotheses, operationalize terms, details of procedure, determine population, etc.)

Step 2a: Operationalize your terms

For the purposes of the in-class experiment, have the students decide on operational definitions of chocolate (M&Ms), a non-chocolate candy (Skittles), and memory. M&Ms is not on its own a sufficient operationalized term. They need to be more precise. How many units of chocolate over what period of time and other factors (should it be per weight of student ingesting, like blood alcohol levels? Hint: do NOT make it per weight because then you will have to have your students disclose statistics and you could alienate a certain gender population).

Discuss how you'll measure memory for this experiment, and what kind of task to use. We've used a study-distractor-test protocol with a list of unrelated words in the past—word list in this file, for you to print, syllabus handout can be a distractor. Have the students think of some ways to test memory, though; this will be good practice for what they'll be doing in the labs throughout the semester. Accuracy scoring is going to be the easiest for this example.

When the student groups have satisfactory operational definitions, lead them in creating a hypothesis in terms of the operational definitions. Defining terms and formulating an effective hypothesis are intertwined steps; they are best accomplished iteratively, and if you can demonstrate this by testing a hypothesis with not-quite rigorously operationalized terms, the intertwined process will be apparent.

Step 2b: Formulate a null hypothesis and a research hypothesis

Have the students formulate a question using their terms—casually mention that the research question is sometimes a good title for the article describing a study—and then lead them through generating null and research hypotheses. Define hypothesis through asking students to create the definitions. You can compare the created definitions to ones given by the textbook, to show where they have been successful in creating the definitions and where they need additional levels of rigor.

Step 2c: Control Groups; Random Assignment

This is an important concept to focus on. How will the students decide which participants will be in which condition? In this section, you'll cover random assignment and the notion of a control group. Prof. Turk-Browne believes that, **"random assignment to condition is the single most important concept in psychology. Without it, we wouldn't have a discipline."**

How will the students be assigned to groups in the chocolate and memory experiment (i.e., randomly)? Suppose you were going to do a large study to test the hypothesis that eating chocolate improves memory. How would you choose people to be in this study? Explain that under ideal conditions, random sampling is preferred because the samples will be most representative of the population as a whole.

Step 3: Run the study (test hypothesis)

This should get us to a study in which:

(1) students eat some candy
(2) they study a list of words
(3) there is a distraction period (can be handing out the course syllabus for the next exercise or discussing a specific set of lab guidelines)
(4) students write down as many words as they can remember from the lists
(5) the groups swap responses
(6) collect the data—students read out the number of recalled words from each paper and you write those numbers on the board grouped appropriately.

Students may come up with a different design than this, and as long as you find the design valid, this is okay, and welcomed. Now discuss how to make sense of the data.

Step 4: Analyze results (organize, code, and tally data, run statistical analysis)

Have students devise data gathering and presentation around theme of Skittles performance vs. M&M performance. Encourage mean, average, and visual presentation. This will be pretty basic. Connecting data to hypothesis, expected outcome, and final outcome. Looking at improvements in future tests.

Step 5: Draw Conclusions (interpret findings, identify flaws in study, suggest further work)

Once you have a result, prompt the students with the conclusion ("This proves that chocolate improves memory/This proves that chocolate does not improve memory") and ask why you do NOT want to draw this conclusion from the experiment. Explore what other factors might be affecting the experiment, which could be tested or controlled.

5 a. Review and improve: design a new study

Finally, return to the chocolate and memory question. Ask students to use the concepts covered in this class to design a new study about the influence of chocolate and memory. They should clearly operationalize their independent and dependent variables, and be able to articulate clear questions and hypotheses, explain who will be in their study and how they will collect their data. Also, have the students describe some problems with the study and think of ways to improve it.

<Syllabus discussion can be run here>

Lab syllabus ...is posted on Blackboard.

There are two parts to presenting the syllabus: what they need to know right away at the start of class, and the rest of it, which can be covered later in class. Rather than starting with the framework of the class, consider covering the need-to-know early in the lab, and then using the rest of the information as a distractor task after you have begun lab.

Lab syllabus need-to-know early on

- ✓ Who you are (please give them a quick idea of your area of research)
- ✓ How this lab fits into the design of the overall lab course
- ✓ How you'd like students to address you

- ✓ Best way for students to reach you

Lab syllabus discussion (can be used as a distractor task)

When you go over the lab syllabus, here are some points you want to highlight:

- How Lab Swapping work (if they need to permanently change their lab assignment)
- Distinguish lab swapping vs. rare substitutions
- Lab worksheets and handouts
- NIH training
- Required research participation (for all Psych courses)
- Late policy on lab reports
- Grading policy
- Computers and lab equipment (log out but do NOT turn off the computers, please—leaving them on allows the computers to be updated overnight.)

There are guidelines that are AI prerogatives, and not in the syllabus. They can include:

- Best way to contact you
- Your office hours, if you keep them (or "By appointment" if you prefer, and how best to procure appointment)
- Submitting lab worksheets: your preferred method (electronic or paper)
- Your preference / policy on (personal and lab) computer use in the classroom, iPhones, iPads…
- Academic Honesty policy (covered on the Lecture syllabus and thoroughly in orientation). You may wish to mention it with regard to working in groups.
- Class conduct (refer to university policy, if you think it useful): http://www.princeton.edu/pub/rrr/ Respect for others, computer and network use, etc.
- Guidelines for succeeding in lab (you can provide, or have the groups create and suggest)
    - Arriving and starting on time
    - Listening, not interrupting speaker
    - Care of computers and equipment
    - Leave the lab ready for the next group (pick up)

Other guidelines you'd like to present…

Review of IV and DV – What went wrong?

Each of the following scenarios describes a hypothetical study. Each study has one or more design flaws. Read the descriptions carefully and identify whether it is an experiment or a correlational study. Identify IVs and DVs (if an experiment), and identify at least one major flaw.

Motivating monkeys

A psychologist wants to determine whether love and affection will make an adult monkey more active. She starts off with a group of 12 monkeys and randomly assigns them to either the experimental group or the control group. Every day the psychologist plays with the animals in the experimental group for 30 minutes but not with the ones in the control group. At the same time, she is careful that the animals in both groups get enough food and water. After one month, she carefully measures the activity level of all of the animals and discovers that indeed, the experimental animals are more active. Based on this result, she concludes that love and affection cause animals to be more active.

Correlation or experiment? IV =

DV =

Major flaw(s):

Birth order and IQ scenario

Researchers surveyed hundreds of children to gather information about their intelligence and birth order. They found that children who were the first born in their family had the highest IQs. Because intelligence can't influence birth order, the researchers conclude that being the first born in a family enhances intellectual growth.

Correlation or experiment? IV =

DV =

Major flaw(s):

Gender and politics

A psychologist is trying to figure out whether males or females know more about political issues. The psychologist interviews people on the street, asking them the name of their home state Senators. He discovers that men are 23% more likely to know the name of their home state Senator, and he concludes that men know more about politics than women do.

Correlation or experiment? IV =

DV =

Major flaw(s):

Scream therapy

A group of psychologists wants to determine whether scream therapy actually helps people feel better. To test this, they recruit a number of subjects who have recently complained of extreme nervousness, carefully measuring anxiety by using a series of psychological tests. They then invite each subject to enter a special sound chamber, and they encourage the person to scream as loudly as possible. After the subjects do so, the subjects report feeling much less anxious. The researchers administer the same tests again, which also show that the subjects are less anxious than they used to be.

Correlation or experiment? IV =

DV =

Major flaw(s):

Wrap up

- Have the students turn in their worksheets to you before leaving lab
- Ask the students to pick up the lab for the next group
- Put poker box back in cabinet (and any "spare" candies—not likely though!)
- Next lab: Neuroanatomy
- **ASK THE STUDENTS TO LOG OUT of their computer station, so the next lab can log in—but to leave the computer on.**
- **If you used the projector, please turn it off. The bulb burns out easily and they are very costly to replace. Thanks.**

Lab 1 – Methods: Word List

Adult
Air
Album
Alphabet
Balloon
Banana
Bridge
Butterfly
Circle
Circus
Clock
Coffee
Desk
Diamond
Dress
Drill
Elephant
Eraser
Explosive
Eyes
Finger
Fire
Floodlight
Flower
Game
Garden
Gloves
Hammer
Hat
Hieroglyph
Hose
Ice
Insect
Junk
Kaleidoscope
Kitchen
Knife
Leg
Library
Liquid
Magnet
Man
Map
Nail
Navy
Necklace
Needle
Onion
Pants
Parachute
Perfume
Pillow
Radar
Rainbow
Record
Rock
Rope
Saddle
Square
Staircase
Table
Tapestry
Tunnel
Typewriter
Umbrella
Vacuum
Vampire
Videotape
Vomit
Vulture
Wheelchair
Window
Woman
Worm
X-ray

Lab 1 – Methods: Definitions

This sheet is a teaching notes aid on the terms we'll teach in lab, guiding the students to write the definitions. Below are definitions pulled from different textbooks. Your definitions in your lab sections should reflect the teachings from Lab 1, not just the textbook definitions.

Must cover

hypothesis

a general statement about the way variables relate that is objectively falsifiable. Defines what you think will happen and states in a way that can be tested and found to be true or false (Comer & Gould, p. 33, 38) // a testable prediction, often implied by a theory (Myers, p. 25; G-6)

correlation

predictable relationship between two or more variables (Comer & Gould, p. 50)

confounding variables

a variable not the independent or dependent variable that can affect the outcome of an experiment // interference by a third variable so as to distort the association being studied between two other variables, because of a strong relationship with both of the other variables // a relationship between two causal factors such that their individual contributions cannot be separated. (Mosby's Medical Dictionary, 8th edition, 2009)

independent variable (IV)

a condition or event that is thought to be a factor in changing another condition or event (Comer & Gould, p. 39) // the experimental factor that is manipulated; the variable whose effect is being studied (Myers, p. 38; G-7)

dependent variable (DV)

the condition or event you expect to change as a result of varying the independent variable (Comer & Gould, p. 39) // the outcome factor; the variable that may change in response to manipulations of the independent variable (Myers, p. 38; G-4)

operationalize

develop very precise definitions of the independent and dependent variables that allow you to measure and test them (Comer & Gould, p. 39)

operational definition

a statement of the procedures (operations) used to define research variables; a definition that tells you how we are measuring the phenomenon we are studying (Myers, p. 25; G-9)

random assignment

assigning participants to experimental and control conditions by chance, thus minimizing preexisting differences between those assigned to the different groups (Myers, p. 37; G-11)

scientific method

a process of logical reasoning derived from philosophy (Comer & Gould, p. 33) // a method of discovery that involves collecting empirical observations and the disproving and refinement of hypotheses (Myers)

control condition

the condition of an experiment that contrasts with the experimental condition and serves as a comparison for evaluating the effect of the treatment (Myers, p. 37; G-3)

Good to cover but not required

replication

repeating the essence of a research study, usually with different participants in different situations, to see whether the basic finding extends to other participants and circumstances (Myers, p. 25; G-11)

empirical

able to be tested in objective ways (Comer & Gould, p. 33)

biases

personal beliefs or conventional wisdom that a particular thinker mistakenly accepts as broad, basic truths (Comer & Gould, p. 33)

deductive reasoning

reasoning proceeding from broad basic principles applied to specific situations (Comer & Gould, p. 33)

inductive reasoning

reasoning process proceeding from small specific situations to more general truths (Comer & Gould, p. 33)