Introduction

How to do an Experiment:
An Overview of this Course

This textbook is part of a course that will give you, the student, hands-on experience with research by guiding you through your own experiment. For this course, you will do all of these things:

- choose a partner,

- choose your own "topic",

- design a method to investigate it,

- collect real data about this topic from real participants,

- analyze it,

- and present it formally in the form of a research paper and a public presentation

This is how graduate students and professional researchers work, so this course will give you the chance to get your hands "dirty" with a real problem of your own choosing. Note that the most successful professionals stand out because they *collaborate* well with other researchers on their experiments. So, for this course you'll do your experiment with a partner. The idea is to simulate in class a research laboratory where there are many diverse but related research problems and there is a lot of collaboration.

You will see for yourself how interesting, creative, time-consuming, easy, or stressful you think it is to do an experiment. You'll also see how important it is to collaborate. Remember, though, before you draw any hasty conclusions that the first time (both for experiments and for collaboration) is always the hardest.

If you are not going to graduate school or do not think of becoming a researcher, even so you will surely face situations where you have to decide whether to believe someone else's research results. Doing an experiment yourself gives you lots of insight into what is reliable and what can go wrong in research, so it will help you evaluate others' results, as well. At the very least, this experience should give you enough of a sample of what professional researchers do to decide for yourself whether you want to do more research or avoid it entirely.

How to do an experiment

Professional researchers carry out the following tasks to do an experiment. For this course, you will, too.

1. **Form a team.** It is lonely, stressful, and inefficient to work alone, especially when you are a beginner. Two heads are truly better than one.

2. **Formulate a research problem.** A research problem is much more precise than a generic "topic". Topics that are more precise make the rest of the research process much easier and make the results more reliable. Above all, pick a research problem that you are interested in!

3. **Find the best publications to review the relevant research literature.** Researchers systematically review what's been studied before so that they can *build* on it (instead of just repeat it) by re-using other researchers' bibliographies, findings, and methods. Everyone is suspicious of "research" that has no links with existing studies.

4. **Write a literature review.** A literature review presents a particular researcher's analysis of what's been studied before, and this unique analysis often leads to new questions and new insights for other researchers.

5. **Design an experiment.** There are literally *thousands* of ways to design an experiment for a given research problem. Researchers decide based on what's already known, what they are familiar with, and the practical problems that they face, among other things. During this task, they focus on the independent and dependent variables.

6. **Specify the methods.** Data collection is only reliable if it's carefully planned out in advance. It is also easier and less stressful that way. During this task, researchers focus on how to measure what they want to measure and on avoiding interference from things that they are not interested in for the moment.

7. **Assemble a proposal.** Researchers everywhere have to ask for permission and funding to get their research done. The proposal helps them convince their supervisors and funding agencies.

8. **Collect the data.** Psychologists usually collect data from people and it's always a challenge to get people to do what you need them to.

9. **Analyze the data.** There are always qualitative and quantitative aspects to data analysis. Professionals focus on making their analyses relevant and reliable.

10. **Write up the results.** It's always a challenge to present complex results to people who are thinking differently from you (they haven't been doing the experiment).

11. **Discuss the results.** Professional researchers focus the discussion on how the experimental results are related to existing results, on which are more reliable and why.

12. **Present the work in public.** Research can only progress by comparing different studies of similar phenomena, so research that's not circulated can't be compared to anything – it's worthless.

What's in this textbook and how to use it

This textbook includes a separate chapter or "Task Package" for most of these tasks. For each task, the corresponding Task Package will tell you what concrete documents you need to produce and hand in (the "deliverables"). Usually, the tasks are organized in such a way that you will put together a full draft (so that you can see what you are not sure of) and only then move on to the final version of the deliverables for that task. The Task Package will also give you a step-by-step guide about how to succeed: what steps to follow and what problems to look out for. If you do not follow the instructions in the guide, you are not likely to do a good job. Each task builds on the ones that come before it, so trying to change their order will only make the experiment more difficult to complete.

The Task Packages are (always) under revision. The most recent version of each Task Package will be distributed as it becomes ready. If you want to read and plan ahead, the previous versions of all of the Task Packages are archived at http://www.mikedillinger.com/PsychWork.html .

A normal university semester is about 15 weeks long, so you have to do most of the tasks in a single week. That means that you have to be very careful to keep up and stay on schedule. This is something that's good to get used to: in graduate school, you'll have funding for a fixed amount of time; at work, you'll have deadlines. Remember: you can only show off your best work if you can finish early and have time to revise. That is true for just about everything: time management is very important. Generally, the semester for this course is organized from week to week as follows:

Week	Goal
1	Draft Problem & draft bibliography due in class
2	Problem & draft bibliography due
3	Partial draft Lit Review due
4	Full draft Lit Review due
5	Lit Review due
6	Methods draft due
7	Methods due
8	Draft data due
9	Spring Break
10	Data Due
11	Draft Results due
12	Results Due
13	Draft Discussion due
14	Discussion due
15	Presentations due
16	Full Final Paper due

Budget more time than you expect: it takes longer to do something for the first time.

Most people find that having to do something they have not done before (with a deadline, too!) is confusing and stressful. If you have a very clear idea of what to do and how to do it at every step of the way, then that knowledge usually makes the task less stressful and makes the final product better.

That is the main goal of this textbook: to provide you with the information you need to start out in experimental research without getting overwhelmed. To minimize your stress and maximize both your enjoyment and the quality of your work, you need to do three basic things:

> **a) stick to the schedule and don't fall behind,**
>
> **b) read the textbook before you start each task,**
>
> **c) ask lots of questions about what you need to do and how best to do it.**

Following these simple steps will set you up to actually *enjoy* doing your own research on a topic that you think is important. The tasks and materials for this course have been calibrated over many semesters to make sure that the project is challenging but not impossible. A lot of effort has been invested in trying to make it enjoyable, as well.