An Introduction to Learning

Lecture 0.5/15

Todd M. Gureckis, Lila Davachi
Department of Psychology
New York University
{todd.gureckis,lila.davachi}@nyu.edu
Agenda for Today

- Give a short overview of course for those still considering to enroll
- Go over syllabus
- Fill our pre-course survey
Who are we?

Lila Davachi
Office: Meyer 871A
Hours: by appt.
Email: lila.davachi@nyu.edu

Lila’s a trained neurobiologist turn world’s leading expert on cognitive neuroscience of memory!

Todd M. Gureckis
Office: Meyer 859
Hours: by appt.
Email: todd.gureckis@nyu.edu

For the past 10 years, I’ve been studying human learning, memory, categorization, and decision making. I’m a electrical engineer/computer scientist by training that switched to psychology for my phd.

How to Email Us:

Examples:
Subject: [learnmem] I have a question
Subject: [learnmem] I am going to miss class
Subject: [learnmem] I enjoyed the last lecture, here is a $$ tip
Let’s get to know one another!
Grading

- 15% Attendance and participation
- 15% Homework and assignments based on readings
- 70% Two exams each covering a particular part of the course (each worth 35%)

This is a core course in psychology, meaning you will be learning about basic concepts needed to be a member of the field. The material will generally be more basic (not an unstructured seminar) and you will be expected to demonstrate mastery.
Books, Readings, and Software

- Books: *Learning and Memory* by Eichenbaum (should be available soon at the NYU Bookstore).

- Additional readings and supplements will be provided on the course webpage.
Why Should I Take This Course?

- You are interested in cognitive science, psychology, learning, memory, neuroscience, animal learning, marketing, education, computer science, sociology, and/or economics

- You have to
Why Should I Drop This Course?

- You have trouble waking up before 2pm
- You have other things you want to do at 2pm instead of attending class (it’s ok, NYC is a fun place, just don’t enroll and go do that other stuff)
- I don’t like reading assignments and prefer to try to “figure things out” by listening to lectures and hope I can fill in the gaps
What is this course about?

- **Short Version:** Learning and Memory

- **Long version:** An introduction to the basic principals of human and animal learning and memory. We will take a broad survey of the field of learning including elementary theories and findings about conditioning, perceptual learning, discrimination, stimulus generalization, learning and memory interactions, the neural systems of memory, episodic and semantic memory, spacing and massed practice effects, metacognition, computational and theoretical models of learning, innate versus learned behaviors, critical periods, implicit/explicit learning, etc...
What is learning?

I think we all probably have some idea about what learning is. However, as soon as you try to define it, you can quickly find yourself stuck.

As an exercise, get in groups and try to define the term “learning”.

What is learning?

I think we all probably have some idea about what learning is. However, as soon as you try to define it, you can quickly find yourself stuck.

```
Learning is the acquisition of a new behavior or a change in behavior over time, which is dependent on experience, is not entirely transitory, and which is for the most part adaptive.
```
What is learning?

- We all know what learning is. However, as soon as you try to define it, you can quickly find yourself stuck.

Learning is the acquisition of a new behavior or a change in behavior over time, which is dependent on experience, is not entirely transitory, and which is for the most part adaptive.

Does it have to be new? Re-learning is learning! Learning to inhibit a behavior is learning (kicking the habit!).... ok we’ll include CHANGE in behavior.
What is learning?

- We all know what learning is. However, as soon as you try to define it, you can quickly find yourself stuck.

Learning is the acquisition of a new behavior or a change in behavior over time, which is dependent on experience, is not entirely transitory, and which is for the most part adaptive.

We wouldn’t want to attribute behavioral change due to maturation or development alone as learning. Thus, must dependent on experience.

However, behavior can change due to experience for many reasons. Get tired? Get drunk/drugged? ... Sorry, but you’re NOT “learning”.
What is learning?

We all know what learning is. However, as soon as you try to define it, you can quickly find yourself stuck.

Learning is the acquisition of a new behavior or a change in behavior over time, which is dependent on experience, is not entirely transitory, and which is for the most part adaptive.

How much experience? Can you learn something in 1 trial? Does it take repeated presentations/exposure?
**What is learning?**

We all know what learning is. However, as soon as you try to define it, you can quickly find yourself stuck.

Learning is the acquisition of a new behavior or a change in behavior over time, which is dependent on experience, is not entirely transitory, and which is for the most part adaptive.

One way around the drunk/tired thing is to say learning is not transitory... but, of course, you can forget what you’ve learned.

Another way is that learning can’t be explained as some innate behavioral tendency in the organism (such as a drug reaction or evolutionarily wired requirements for sleep).
**What is learning?**

- We all know what learning is. However, as soon as you try to define it, you can quickly find yourself stuck.

Learning is the acquisition of a new behavior or a change in behavior over time, which is dependent on experience, is not entirely transitory, and which is for the most part adaptive.

Maybe you have to want to learn? Can learning be implicit --- in accessible to your conscious will or desire? Probably.
What is learning?

We all know what learning is. However, as soon as you try to define it, you can quickly find yourself stuck.

Learning is the acquisition of a new behavior or a change in behavior over time, which is dependent on experience, is not entirely transitory, and which is for the most part adaptive.

Is learning always adaptive? My argument would be yes. Learning is an ADAPTIVE change in behavior to contingencies in the world. That is the FUNCTION of learning. Surely there are mal-adaptive examples of learning (learning obsessive habits), but these are likely just manifestations of mistakes due to the flexibility of the system. The primary role of learning in a organism is to enable adaptation.
How does one know that learning has occurred?

- Besides measuring the synapses of individual neurons, we only know that learning has occurred by observing changes in performance.

- However many problems with this criterion:
  - Some things may result in learning but no immediate change in behavior (learning a new fact or something about the world may not immediately lead to a measurable change in performance)
  - Must be motivated to learn, but also motivated to express the change in performance.
  - Must be attending to the relevant information in the world in order to show change in performance.
  - This is why studying learning in certain animals (e.g. children) is so difficult! We can’t be sure to have them properly motivated and attending so as to express behavior even if capacity for learning
What is the difference between learning and memory?

- Is there there a fundamental difference between learning and memory? Probably not! That is why most textbooks (including ours) have some variant of “Learning AND Memory” in their title.

- Both are experience-dependent changes to the structure of the brain. (e.g., the change or acquisition of an association between a tone and shock has to be a form of memory as well. Without memory what can be learned? Without learning how can you form new memories?)

- That said, the particular research approaches for the study of learning and memory are quite distinct, despite being *THEORETICALLY* two sides of the same coin.

- The goal of this class is to surf the chasm between these approaches and see what we can learn (or remember!).
**Why study learning and memory?**

- Learning is everywhere! You are learning right now!
- Our experience shapes who we are (we are not only our genes!)
- Imagine what it would be like to lose our memory... (ex: Clive Wearing)

- Accomplish musician who was got a herpes simplex infection
- Anterograde amnesia - can’t form new, lasting memories subsequent to event
- Retrograde amnesia - loss of memory from previous leading up to amnesic event
- Lives in a constant state of “reawakening” to the reality around him

*Clive Wearing and his wife*
Why study learning and memory?

- We (as individuals) have no intuition about how our memory works!
Why study learning and memory?

- We (as individuals) have no intuition about how our memory works!

![Graph showing actual recall and predicted recall with bars for SSSS, SSSR, and SRRR conditions.](image)
Course Webpage

http://gureckislab.org/courses/spring16/learnmem/

- All lectures, hand outs, announcements, etc... will be made here. Please check back often/bookmark