Learning Theory
Learning Unit Outline

What is learning?

Classical conditioning

Operant conditioning

Cognitive learning
What is learning?

**Learning** is the process of adapting behaviors based on past experience

- Anything we are born knowing how to do is NOT learned – it is instinctive
  - Babies do not have to learn how to breathe
  - But they do have to learn how to crawl, talk, etc.

So, how do we learn then? – Two ways…

- Trial and error on our own
- Observations of our environment
Based on what you know now, what are some examples of learned behavior?

• Why are they “learned” behaviors?

Topics covered in the unit

• Three main explanations for the development of learning habits and preferences to learn
  1. Classical conditioning
  2. Operant conditioning
  3. Cognitive learning

Aka associative learning – happens without thinking about it
Learning Unit Outline

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Classical Conditioning

Think about your favorite food. How does your body react to that?

Classical conditioning is a method of learning where you link one stimulus to another stimulus to produce a response.

Example: Thinking about food helps you recall the taste. This in turn makes your mouth water.

• Before I learned that a Pepe’s White Clam pizza was the best tasting thing EVER, the thought of it would not make my mouth water. Now it does.
What’s a *stimulus*?
- Something that produces a reaction in a person or animal

What’s a *response*?
- A reaction to a stimulus

Example of stimulus and response: Tasting food -> mouth watering (stimulus -> response)
- Example of a biological response through our sympathetic nervous system – we are preprogrammed to produce saliva to start the digestive process when we put food in our mouths
Classical Conditioning (cont.)

About 100 years ago Ivan Pavlov stumbled upon how we can LEARN to associate a previously unrelated stimulus to a response (with help from his dog)

- He was trying to study digestion
- He would ring bell -> then give dog meat powder -> dog would salivate
  - He always followed same procedure over and over again
  - After a while after he would ring bell -> Dog would salivate without the meat powder

Pavlov had discovered classical conditioning

- Pavlov’s Dog Gets Conditioned (3:08)
  
  http://www.youtube.com/watch?v=CpoLxEN54ho

Can you think of any other examples of this?

- How about run the can opener -> the cat comes running

Ivan Pavlov bio
This is probably the most famous psychological experiment in history. It has made its way into pop culture…

“And then it hit me: I’m salivating over a goddam bell.”

Now for some more practice identifying USs, URs, CSs, and CRs…
Specific terms associated with classical conditioning…

*Unconditioned stimulus* (US)
• Action that causes an automatic - instinctive, not learned - response (the meat powder)

*Unconditioned response* (UR)
• Reaction to the US (salivation *before* conditioning)

*Acquisition*
• When the link is first established between the US and the CS (the dog associates the bell with the meat powder)

*Conditioned stimulus* (CS)
• Action that was previously neutral (the bell) but now causes a response because it is now associated with the US

*Conditioned response* (CR)
• Reaction to the CS (salivation *after* conditioning)
Use proper psychology terminology during our discussion about the demonstration!

- Classical Conditioning
- Reflex
- Associative Stimulus (unconditioned, conditioned & neutral)
- Response (unconditioned & conditioned)
- Acquisition
- Extinction
- Spontaneous recovery
- Generalization
- Discrimination
So, what is learning?
How does classical conditioning occur?
How does conditioning affect emotions?
How can you use classical conditioning in your lives?
Learning Unit Outline

What is learning?

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Operant Conditioning

What does “cause and effect” mean?

- The causal relationship is at the heart of operant conditioning

*Operant conditioning* is a type of learning where voluntary behaviors are conditioned

- As opposed to classical conditioning where involuntary responses are conditioned
  - Classical conditioning -> blinking (involuntary)
  - Operant conditioning -> cleaning your room
- Learning from the results of what you do, the consequences of your actions -> cause and effect
Edward Thorndike (1874-1949) was one of first to research this type of learning

- Came up with the *law of effect*
  - If consequences of a behavior are pleasant, connection between stimulus and response will get stronger, and likelihood of the behavior will increase
B.F. Skinner (1904-1990) built on Thorndike’s theories

- Coined the term “operant conditioning”
- Invented the “Skinner Box” (aka operant conditioning chamber)
  - Enables researchers to apply operant reinforcers and punishment in a controlled setting

A “Skinner box”
Operant Conditioning (cont.)

Consequences could be positive or negative

*Positive consequences* -> learn to engage in behavior that generate desirable consequences
  - Your parents offer to let you have more time playing video games if you clean your room

*Negative consequences* -> learn to engage in behavior that helps avoid negative consequences
  - Your parents say you can avoid additional chores if you clean your room

Going to work, does that have positive or negative consequences?
- Both
  - You get paid if you go to work (positive)
  - You avoid getting fired if you go to work (negative)
Operant Conditioning (cont.)

The consequences can act as a reinforcement

- Where the consequence (cause) increases the chances of the behavior they follow occurring again (effect)

Two types of reinforcers

*Positive reinforcers*

- Increase the frequency of a behavior they follow when they are applied
- Application is pleasant in some way
  - Food -> Dolphin does tricks
  - Social approval -> shoot spitballs at teacher
  - Do psych homework because it is unbelievably interesting -> Study more

*Negative reinforcers*

- Increase the frequency of a behavior they follow when they are removed
- Remove an aversive stimulus in some way
  - Stop annoying beeping -> seatbelt fastened
  - Don’t want to be beaten up by bully -> shoot spitballs at teacher
  - Possibility of getting grounded for bad grades -> Study more
The consequences can also act as *punishment*

- **Where the consequence (cause) **decreases** the chances of the behavior they follow occurring again (effect)**

There are also two types of punishment

*Positive Punishment* (usually just referred to as “Punishment”, like in Coon)

- **Decreases** the frequency of a behavior they follow when they are **applied**
  - Get spanked -> Won’t talk back to your father anymore

*Omission training* (aka “negative punishment”. Coon calls it “response cost”)

  **Decrease** the frequency of a behavior they follow when they are **removed**
  
  Get phone taken away for “back sassing” -> Won’t talk back your father anymore
Confused? Here is a chart that should help you out!

### Incidence of a behavior...

<table>
<thead>
<tr>
<th>Increases</th>
<th>Decreases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applied</strong></td>
<td><strong>Removed</strong></td>
</tr>
<tr>
<td>Positive Reinforcement</td>
<td>Positive Punishment</td>
</tr>
<tr>
<td>After consequence applied, frequency of behavior increases</td>
<td>After consequence applied, frequency of behavior decreases</td>
</tr>
<tr>
<td>Ex. Social approval -&gt; shoot spitballs at teacher</td>
<td>Ex. Get spanked -&gt; don't shoot spitballs at teacher anymore</td>
</tr>
<tr>
<td>Negative Reinforcement</td>
<td>Omission Training</td>
</tr>
<tr>
<td>After consequence removed, frequency of behavior increases</td>
<td>After consequence removed, frequency of behavior decreases</td>
</tr>
<tr>
<td>Ex. Bully threatens to beat you up -&gt; shoot spitballs at teacher</td>
<td>Ex. Have phone taken away -&gt; don't shoot spitballs at teacher anymore</td>
</tr>
</tbody>
</table>
Reinforcement and punishment can take two forms

**Primary reinforcers**
- Related to the biological makeup of the organism; does not have to be taught
  - Ex: Food, water, warmth

**Secondary reinforcers**
- Those linked to primary somehow, links have to be taught
- Two types of secondary reinforcers
  - **Tokens**
    - Can be exchanged for primary reinforcers
      - Ex: Money (secondary) is exchanged for food and shelter (primary)
  - **Social reinforcers**
    - Learned desires for attention and approval; very powerful
    - Can you come up with any examples?

What generally works better, reinforcers or punishment?

“Why Rewards Are Better Than Punishment” handout
Operant Conditioning (cont.)

The timing of operant reinforcement matters
• It is most effective when it rapidly follows a correct response, especially in immature subjects
  • *Immediately* praise a child for good behavior

Over time we learn that reinforcement can be delayed
We realize that we have to do a series of things before we get our single reward at the end
Called *response chaining*
• Ex. Go running three times a week for three months -> fit into your jeans again
• Any other examples?
• Key is that we do a series of things for a single reward at the end
What if desired responses rarely occur? How can we use operant conditioning to teach someone to do something relatively quickly?

**Shaping**

- The gradual molding of responses to a desired pattern
  - Reinforce *every step in the process* until the desired behavior occurs
  - Works when the subject at first has no clue about the benefits of the desired behavior
- Example is that “Pigeons Playing Ping Pong” video I showed earlier this year
- Shaping behavior can be entertaining
  - p. 231 Coon “Shaping a Teacher”
  - Shaping demonstration
Reinforcement schedules

- Patterns of reward; two types

1. Continuous reinforcement
   - Receiving reward each time target behavior performed
     - Child gets gold star every time he/she used potty
     - Very effective when first trying to teach a new behavior
     - Not as effective after a while because if not rewarded once, extinction sets in quickly

2. Partial reinforcement works better in the long run
   - Once behavior is learned, transition to reinforcement not every time behavior is performed makes behavior much less prone to extinction
     - Called the partial reinforcement effect
   - Why do you think that is?
Partial reinforcement schedules vary in two ways:

- When the reinforcement is delivered – either the number of responses \((\text{ratio})\) or the amount of time passed \((\text{interval})\)
- The pattern of reinforcement – either constant \((\text{fixed})\) or changing \((\text{variable})\)

### Schedules of Reinforcement

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Fixed</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ratio</strong></td>
<td><strong>Fixed Ratio</strong></td>
<td><strong>Variable Ratio</strong></td>
</tr>
<tr>
<td></td>
<td>Reinforcement applied after a set number of responses</td>
<td>Reinforcement applied after a changing number of responses</td>
</tr>
<tr>
<td><strong>Interval</strong></td>
<td><strong>Fixed Interval</strong></td>
<td><strong>Variable Interval</strong></td>
</tr>
<tr>
<td></td>
<td>Reinforcement applied after a set amount of time</td>
<td>Reinforcement applied after a changing amount of time</td>
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Schedules of Reinforcement handout
Operant conditioning review

- Identify the following in the clip from “The Big Bang Theory” (Not all are illustrated in the clip.)

- Law of effect
- Positive reinforcement
- Negative reinforcement
- Positive punishment
- Omission training
- Response chaining
- Shaping
- Reinforcement schedule
Learning Unit Outline

What is learning?
Classical conditioning
Operant conditioning
Cognitive learning
In both classical and operant conditioning is how we learn things without thinking about it. Do we learn in other ways?

**Cognitive learning**

- Goes beyond basic conditioning and into the areas of memory, problem solving, and/or language
  - What do I mean by that?
- Refers to things we learn because we THINK about them
  - Give me an example of something you learned based on thinking about it
  - How about stuff you learned in school?
Cognitive Learning (cont.)

How do you get to Five Guys in New Haven from here? How are you able to tell me that?

Say if I told you that there is an accident on Amity Rd. in front of Antonio’s blocking traffic in both directions. Could you still tell me how to get there? How did you do that?

You used information you have learned over time and put into a *cognitive map*

- An internal representation you have in your mind
- Cognitive maps don’t have to be directions
  - How to make microwave popcorn
  - The plot of the last work of fiction you read
  - Content you are learning in school
    - I always tell my history students to think of history as a story – helps you make a cognitive map in your head and helps you remember it better (BTW it works for psych too)
    - Graphic organizers are essentially pictorial representations of a cognitive map – that is why they work for so many
Cognitive Learning (cont.)

Make a graphic organizer of some information from this unit using the following terms. Your graphic organizer should show any connections some terms have with others. I’m going to call on someone to put it on the board.

Once done, this can act as a cognitive map.

Learning
Classical Conditioning
US
UR
Acquisition
CS
CR
Operant Conditioning
Positive Reinforcement
Negative Reinforcement

Positive Punishment
Omission Training
Primary Reinforcers
Secondary Reinforcers
Reinforcement Schedules
Cognitive Learning
Cognitive Maps
Latent Learning
Discovery Learning
Observational Learning
The first time you went to Five Guys, how did you know how to get there? Did you have to be driven there? Or did you just pass it one day, file that information in your memory, and then use it when you needed it?

If you filed it away for later, that’s called latent learning.

- When you learn something without obvious reinforcement and it remains hidden until reinforcement is provided.
- What? Learn without reinforcement? How can we do that?
  - Because of our big frontal lobes, humans can anticipate future reward – we know the reinforcement will eventually come.
    - Tasty Five Guys burger.
    - Notice that personable, cute girl. Now so when she finally gets tired of dating jerks you can move in and ask her out.
      - (I called it “laying the groundwork” – worked for me 😊)
  - Give me more examples.
Discovery learning

- Learning based on insight and understanding instead of rote (mechanical repetition and memorization)
  - Teach someone how to solve a problem a certain way and he/she will be able to solve a similar problem
  - Book example: Finding the area of a parallelogram
    - Give me another
  - However, don’t let people wander around aimlessly figuring this stuff out -- best teaching is based on **guided discovery**
    - Remember what Vygotsky called that?
      - Scaffolding
Can we learn just by paying attention to our surroundings and what is going on around us?

Observational Learning (aka Modeling)

- Just watching -- not interacting -- with a model (someone serving as an example) and noting the consequences of that person’s actions -- just doing that can help us to learn to imitate that behavior
- There are several prerequisites
  - Learner must pay attention to the *model*
  - Learner must remember what was done
  - Learner must be physically/mentally capable of reproducing the modeled behavior
    - Will I ever be able to dunk a basketball? Time will tell 😊
  - Model must be successful at task or rewarded for a response
  - When learner does it, he/she must be receive normal reinforcement
- I showed you the picture of the kid shaving in the mirror with his dad. Give me some examples of behaviors people learn through observational learning
  - How about aggression?
Groundbreaking study conducted by Albert Bandura et al
Bobo doll video (4:09)

What do the results of this study (and subsequent studies) tell us?
- Modeling has very strong effect on behavior
- “Do as I say, not as I do” doesn’t work
Is there a link between observational learning and media violence?

- A researcher named Holland in 2000 found there is. The findings were:
  - Media violence supplies models of aggressive skills
  - Gives ideas about the situations where to use these aggressive skills
  - Frequency of watching violence is correlated to frequency of using violence to settle conflicts
  - Leads to emotional desensitization to violence
  - Frequency of watching violence when younger is correlated to violent/aggressive behavior as adults

What is your reaction to this?
Advertisers rely heavily on observational learning through the media.

- “The Marlboro Man” is one of the most famous ad campaigns of all time – built Marlboro into the dominant cigarette brand in the 1960s, especially among men.
  - What could one “learn” from these ads? (i.e. What did consumers link to the behavior of smoking Marlboro’s?)
  - Why does this help make the ad successful?
- Give me some other examples.
- People tell me that the alcohol of choice at parties now is vodka.
  - How has observational learning contributed to that?
In Closing...

What is learning?

Compare and contrast classical conditioning vs. operant conditioning vs. cognitive learning