**Assignment 2: Learning and Memory.**

The activities in this assignment are designed to help you develop an understanding of learning and memory that will serve as a foundation for our study of memory disorders in later chapters (e.g., Alzheimer’s disease) and specific learning based therapeutic techniques such as behavior modification. In addition, we will also apply these concepts to help you become a more effective college student.

**Preparation.** Read chapter 2 and complete the reading quiz on D2L before you complete this assignment. You will need to have your book open. Your book will directly connect you to a web site to access video cases for this assignment so you must have access to an internet connection but all other browsers and Skype should be off while you complete the assignment.

*Course Note: In the traditional lecture style class we use three 50-minute lectures to work through these concepts. Allow 150 minutes to complete this assignment over a 24 hour period. Don’t forget that you can use the Live Online Chat or Discussion Board for this unit to ask questions about the assignment.*

**GRADING:** This assignment is worth 54 points. When you have completed the exercises in this handout you will be required to enter your answers in D2L. You will be allowed to complete the assignment up to two times. D2L will grade your assignment you will be able to view all incorrect answers under submissions. *Please keep in mind that once you start an assignment on D2L you must finish it within the time limit. So do not proceed to D2L until you have completed all parts of the assignment in this handout first.*
Part 1. The Serial Position Effect And Your GPA

We will start with an examination of your learning abilities. Please note that this demonstration will be difficult at first. In this first demonstration you will learn a list of words. Let's get started. Note: make sure you have a hard copy of this assignment in front of you. IMPORTANT: Do not start this assignment unless you can spend at least 30 minutes on Part 1 without having to take a break AND YOU MUST BE ABLE TO WORK ON THE ASSIGNMENT FOR ANOTHER 30 MINUTES TOMORROW or the demonstration will NOT work.

In almost all of your classes you are confronted with the challenge of learning a large number of new and unfamiliar terms. In this demonstration you will be shown the barriers to learning new terms and then learn how to overcome these barriers to improve your memory and your test performance.

Step 1.) Select Serial Position Effect from the Experiments menu in your book.
Step 2.) From the popup menu select Experiment 1 and follow the instructions on the screen. Complete the practice only and then stop but do NOT exit the program. Note: at times it may seem like the computer is taking a long time. Everything is working fine just wait for the next set of instructions. The experiment uses very specific timing routines for each step. We will explain the purpose later. Complete the practice and then read the next paragraph.

You probably scored 100%. But you only had to learn four words. Let's up the stakes. Now let's try to learn 25 words. Before you get upset you have to learn about 60 new terms for this unit. Those of you taking Anatomy and Physiology have over 100 to learn for each test. So 25 should be a piece of cake. It won't be easy but give it your best effort.

Step 3.) Now complete one trial. Then return to these instructions. Remember you can use any strategy to remember the words but you can NOT write anything down. Click on the start button.

Don't panic. You probably got 4-6 words correct for your first try. Which is about 22% correct (or an F on an academic scale) and this score clearly is not acceptable. Before we solve your learning and memory deficit let's look closer at what is going on in this experiment.
1.) According to the cognitive view of memory presented in the text, there are three levels of memory processing. What are they?

a.) sensory memory → short-term memory → long-term memory
b.) initial memory → intermediate memory → long-term memory
c.) cued recall → free recall → reflexive recall
d.) sensitization → associative learning → associative memory

Circle your answers for entry into D2L later

You should have answered A. If not, change your answer (this is a free question). When you learn something new the information is first processed by sensory neurons. In this case sensory neurons in the visual pathway are processing the words. But they can only remember the information for about 18 ms after the item is no longer present. Do you remember that after each word you saw “++++++++” presented? The purpose was to erase your sensory memory and force you to move the word into the next memory store called active memory or short-term memory which is processed by your hippocampus. We remember information in the hippocampus for as long as we are actively rehearsing the information (such as where you parked your car or the things you need to buy at the grocery store). Each time you said the words to yourself (rehearsed or practiced) some of the words were transferred into your long-term memory that is stored in your cerebral cortex.

2.) The act of reviewing words during studying?

a.) involves using your hippocampus
b.) involves using your active or short-term memory
c.) transfers the information into long-term memory in the cortex
d.) all of these

What do you think will be true about your ability to recall those words that you practiced (studied) the most? Let’s see if you are right. From the **graph menu** select **Plot last trial**. The graph displays those words you learned based on their position in the list.

Most people on the first trial or test will remember only words from the beginning of the list (noted as block 1 on the X axis of the graph) and few if any more words will be recalled although some may be recalled from the fifth block of trials (words 20 to 25 in the list).

Step 4.) Now complete **another trial**. Then return to these instructions. Remember you can use any strategy to remember the words but you can NOT write anything down. **Click on the start button.**

From the **graph menu** select **Plot last trial**. Then from the **graph menu** select **Serial Position Effect**. The graph displays those words you recalled
based on their position in the list and the theoretical curve for the Serial Position Effect. Compare the two curves.

3.) What is it called when people tend to remember information better from a list or words or terms if they appeared at the beginning of a list?
   a.) primacy effect
   b.) recency effect
   c.) serial position effect
   d.) sensory memory

4.) What is it called when people tend to remember information better from a list or words or terms if they appeared at the end of a list?
   a.) primacy effect
   b.) recency effect
   c.) serial position effect
   d.) sensory memory

At this point you have only completed two trials. So your curve will not be identical to the theoretical curve (yet). But you should find that most of the words you are recalling are coming from the beginning and end of the list. Why?

To answer this question lets talk a little more about how the experiment is set up. It probably annoyed you a little that there was a delay between the last word and the appearance of the screen that allowed you to start typing in the words. This delay was 20 seconds long. Twenty seconds is the average time a person can recall information if it is stored only in their hippocampus. So when you are learning a list of terms (and their definitions in a class) you have twenty seconds after you stop practicing them before you forget them. This means that unless you were actively practicing those words during the delay the only words you are able to remember had to be moved into your long-term memory which will be those words you practiced the most or those at the beginning of the list (primacy effect). Any words you practiced last will still be in your hippocampus and you will be able to recall some or all of those (recency effect). But people tend to forget those in the middle any time the list over 10-15 words (for the average college student). The tendency to remember information from the beginning and end while forgetting material from the middle is called the serial position effect.

Step 5.) Now complete another trial. Then return to these instructions. Remember you can use any strategy to remember the words but you can NOT write anything down. Click on the start button.
From the **graph menu** select **Plot last trial**. Then from the **graph menu** select **Serial Position Effect**. The graph displays those words you recalled based on their position in the list and the theoretical curve for the Serial Position Effect. Compare the two curves.

At this point your recall curve should be pretty close to the theoretical serial position effect. Some of you may even have begun to remember some words from the middle although it is still early in the learning process. However, every trial that you complete from this point forward will start to reduce your tendency to forget the middle of the list.

Have you ever taken a test and found that some questions on the test seemed to come from out of no-where? In fact, perhaps you even went to the professor and complained that the questions were unfair and were not covered. If you looked closely at those questions you would find that they came from the middle of your lecture notes and/or the middle of your reading notes (or assigned readings). What does this mean?

It means that there was more information on the test than you were able to process given the amount of study time (trials completed) that you put in. This happened because you always start at the beginning of your notes and read through them from front to back (as do most students). Whenever you have more than 10-15 terms or concepts to learn (which in college is almost always the case) your test grade will be impacted by the serial position effect. But, there is a way around this.

Remember that in the practice trials you scored 100% when the list was short your memory only failed when the list was long. Well then one way to remember more is to reduce the amount of information you need to learn in each study session (trial). The easiest way to do this is to study for 20 minutes at a time for any one course (shorten the list). Also each time you study start in a different place in your notes (shift the order of the content). By shifting your starting point you are changing which terms appear at the beginning of your study session (word order in our experiment) and the net effect will be to reduce or eliminate your tendency to forget the information presented in the middle. The problem of the mysterious questions from no-where solved.

5.) If you take a test and there appears to be questions that don’t seem to have come from this unit or course you are probably experiencing?
   a.) the primacy effect
   b.) the recency effect
   c.) the serial position effect
   d.) a really unfair test
6. If you tend to forget information on tests from the middle of your reading or lecture notes what can you do to improve your grades?

a.) study in shorter sessions
b.) start at different places in your notes
c.) increase the number of study sessions
d.) all of these

Step 6.) Now complete another trial. Then return to these instructions. Remember you can use any strategy to remember the words but you can NOT write anything down. **Click on the start button.**

From the graph menu select Plot last trial. Then from the graph menu select Serial Position Effect. Compare the two curves.

By the fourth trial, most students are starting to get to about 30-40% correct (still an F) but you are also starting to remember words from the middle although the number is still much lower than words from either end of the list. This observation confirms that we need more practice (study time) to master greater amounts of information. Mom was right. Practice makes perfect.

One method of eliminating your tendency to forget the middle is to study the list as many times as possible. But you already know this. If you want to get good grades you have to study. If you want to become good at a sport or at playing a piece of music you have to practice. But more practice is not the whole story and your time is limited.

Step 7.) Now complete one last trial. Then return to these instructions. Remember you can use any strategy to remember the words but you can NOT write anything down. **Click on the start button.**

From the graph menu select Plot last trial. Then from the graph menu select Serial Position Effect. Compare the two curves. Finally, from the graph menu select Plot All Trials. Examine this graph it is your learning curve.

Notice that your learning curve shows considerable progress. In fact you have most likely doubled your performance from your first trial! Not bad but you still have not mastered the material (i.e., reached peak or 100% correct). Don’t be upset if you are still only around 40% correct. Its normal and you may even be below 40%. Your performance in this experiment has been below your expectations of your abilities because we have simulated the effects of cramming or pulling-an-all-nighter for a test (i.e, massed trials). Psychologists have known for over 70 years that spacing trials out (studying a little each day) leads to **faster learning in fewer trials** compared to massed trials completed all at once (cramming). To really illustrate this point we need to complete one more
trial in 24 hours. So we are going to take a time out. Stop working on part 1 and resume tomorrow as close to the same time as possible (not earlier). You may continue to work on parts 2, 3 and 4.

Stop and resume Part 1 24 hours later. To continue working on other parts of this assignment skip ahead three pages.
Part 1: Twenty-four hours later. Take out a sheet of paper and write down all of the words (in any order) from yesterday’s memory test. Limit your time to complete the test to only 60 seconds. If you need a clock select Stopwatch from the Experiments menu in your book. After you complete this free recall test of the words that were stored in your long-term memory score the accuracy of your memory by selecting Assignment 2 from the Assignments menu and then click on the 24 Retest button and follow the directions. When you have your data please examine the Figure 1.

Figure 1. Students enrolled in an Introduction to Psychological Science course completed the same five trials using the same words you just completed. One hundred and twenty subjects were randomly selected and randomly assigned to receive either massed or spaced training. Sixty of the students completed the trials in one day over the course of 30 minutes (massed training or similar to cramming for a test). Sixty additional students completed one trial per day. Both groups then completed a retention test 24 hours later in which they had to remember the list (any order) without reviewing the list (called a free recall test). Subjects who spaced the training out over five days remembered significantly more (a 68% increase) words 24 h later compared to subjects who completed all their trials in one day t(118) = 5.580, p < 0.05).
7.) Apply what you learned in chapter 1 about reading graphs and inferential statistics. Based on the data presented in Figure 1, which of the following is the best conclusion for our experiment?

a.) Studying all the material in one long session is significantly more effective than studying in short sessions over more days.
b.) Studying all the material in one long session results in significantly fewer words being recalled compared to studying in short sessions over more days.
c.) The retention of verbal learning is significantly correlated with the number of trials per day spent studying.
d.) The retention of verbal learning is not influenced by your method of studying.

Why does the difference in performance exist? While both groups received the same amount of training (five trials), the spaced trials group received one night of sleep between each trial while those in the massed training group (i.e., you) only received one night of sleep between training and recall. To see why this is important select the Assignments Menu in your book and then Assignment 2. Click on the Sleep Effects Memory.

8.) Based on just the film clip, what is the role of dream sleep in memory formation?

a.) Non-REM dream sleep allows us to practice what we learned during the day and contributes to the movement of memory from short-term memory to long-term memory.
b.) REM dream sleep is important for learning how to apply new memories in situations we have not yet encountered.
c.) If you do not obtain enough sleep, you are likely to remember words at the end of a list but not those words from the beginning.
d.) all of these.

Lets put this all together. In our experiment you were in the massed trials group and studied the words over five trials and spent only 10 minutes actually studying the words. Your performance was poor because you did not have the opportunity for dream sleep between trials. As shown in the video we rehearse new behaviors and material during dream sleep which increases our performance 24 hours later. So the spaced trials group received four nights of sleep versus your one night and their performance was up because during dream sleep memories are built and moved from the hippocampus to long-term memory stores in the cortex. How do we know this? Schoen and Badia (1984) and other researchers have demonstrated that if you deprive a person of dream sleep but allow them to still get a normal night’s sleep they are unable to recall what they learned during the previous day. It is interesting to note that the theta waves
recorded during your dream sleep originate in the hippocampus (your active learning center and source of your short-term memories) but the hippocampus does not control or regulate the complete sleep process. The regulation of sleep occurs in the pons. We will discuss sleep further in the next unit.

So the reason why you performed poorer than the spaced trials group was that you had less opportunity to practice the list during dream sleep. In fact this is also why you probably actually did worse today than yesterday. People need dream sleep between each trial for the full benefit of dream sleep.

9.) Based on the film clip and Figure 1, what is the best way to study for this course and learn important information?

a.) The most effective method is to study in one long session right up to the start of the test.
b.) The most effective method is to start studying as early in the semester as possible to maximize the amount of dream sleep.
c.) The amount of studying completed is not important. It is only important to get as much sleep as possible the night before the test.
d.) none of these.

Final Observation. The spaced trial group only studied for two minutes a day and was able to essentially beat you by about 68% even though you studied for 10 minutes. If they had run only two more trials most would have reached 100% in 14 minutes of total study time. But, for you and the others in the massed trials group you would have needed another 10 session or 30 minutes total study time to achieve 100%. So studying in short sessions each day is a more efficient and effective method for learning compared to the way most students report studying. If you want to become a better student in less time and get more out of your college education you may want to change your study habits and use your psychology.

Interesting Side Story: A few years ago a student from the spaced trials group came back after three years and completed a free recall test (without more training) and even though she had scored only 55% during her 24 h free recall test three years earlier she now recalled 22 out of 25 words (88% correct)! This is not a formal study and is only anecdotal but it illustrates the power of spaced trials. Several studies have shown that most students recall only 15% of the material from their courses after one year! Imagine the impact of a college education if everyone used their psychology to study for a course.

Let's review basic classical conditioning terminology using Pavlov's own class film (select Assignments Menu → Assignment 2 → click on Pavlov).

Classical conditioning is more than just dogs salivating to conditioned stimuli. Emotional memories can be acquired through classical conditioning. We are going to examine two clinical applications here. The first involves the development of a specific type of anxiety disorder called a phobia. Phobias are intense fears that are so strong that the fear causes a person to change their behavior and can impair thinking. View the video case Vivian (select Assignments Menu → Assignment 2 → click on Vivian).

10.) Identify the stimulus/stimuli influencing Vivian’s behavior to the correct classical conditioning concept. You may need to watch the clip again.

conditioned stimulus ____________________________
unconditioned stimulus __________________________
conditioned response ___________________________
unconditioned response __________________________

11.) Based on Chapter 2, design a treatment plan to eliminate Vivian’s phobia with the least chance of remission.

Drugs can also induce strong emotional responses and as a result the brain can learn conditioned drug responses. These responses have profound implications for addicts who wish to quit using. View the next case (select Assignments Menu → Assignment 2 → click on Conditioned Drug Responses).
12.) What were some conditioned stimuli that the addicts reported induced drug cravings as long as three years after last using a drug?

a.) The smell of a drug or drug preparation.
b.) Watching someone else use drugs (in person or on film).
c.) Locations (e.g., street signs, places where drugs were previously used).
d.) all of these

13.) Imaging studies have implicated the ____________ as a structure that is important for learning conditioned drug responses.

a.) amygdala  
b.) cortex  
c.) hippocampus  
d.) pons

Remember these addicts had been through a nasty forced withdrawal while in jail. Both expressed a strong desire to quit and had been drug free for as long as three years! But both also described a powerful magnet-like draw to use drugs when confronted by conditioned stimuli and were using within an hour of being released from custody. Less than 20% of addicts stay in recovery beyond a year because few treatment programs attempt eliminate these conditioned drug responses even though Pavlov first reported their existence (using morphine) in the 1920’s!


Not all behavior can be explained by classically conditioned reflexes. Goal directed behavior is acquired through operant conditioning. The concepts of contingency and contiguity that were required to learn classically conditioned responses also apply. Contingency and contiguity are relatively straightforward concepts but their effect on behavior is another story. To illustrate the importance of contingency we will use E. L. Thorndike’s original puzzle box which I recreated from his published plans (Thorndike, 1898) and my nine month old cat. Who happens to be named Harvey Thorndike. Harvey’s food bowl was always filled twice a day. His training always occurred just before his 5 AM feeding.

View the next case (select Assignments Menu → Assignment 2 → click on Law of Effect). You will see the first and last training trials. Time how long it took for Harvey to escape (if you need a stopwatch select stopwatch from the Experiments Menu) and record how he did it as well as all of the
other behaviors he tried that failed. Keep in mind that in the original study the cat was required to learn to pull on a cord to open a door. Thorndike reported that cats quickly learned to use their paw to pull the cord and obtain their food reward. That is what I expected Harvey to learn. Record your observations in the table below.

<table>
<thead>
<tr>
<th>Trial</th>
<th>Time to Escape</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Questions 14.) to 16.) Thorndike’s law of effect states that behavior occurs in a kind of random, trial and error fashion, if behavior is followed by pleasurable consequences it will be repeated in the future. If not the behavior will decrease or be eliminated.

14.) Compared to the first trial which behaviors were **reduced** or **eliminated** in the last trial due to the absence of a contingency between the behavior and a desirable consequence? Circle all that apply.

a.) sticking the paw(s) out to get the food or food bowl  
b.) vocalizing  
c.) sticking the paw(s) out through the bars (unrelated to the food bowl)  
d.) pressing on the door with head or paws  
e.) using his mouth/head to pull on the cord
15.) By the last trial, what were the contingencies (behavior→consequence) learned by Harvey?
   a.) Sticking the paw(s) out between the bars leads to food or opens the door.
   b.) Vocalizing loudly until my pet human (you don’t own cats they tolerate you) comes leads to being released.
   c.) Biting and pulling down on the cord opens the door.
   d.) Pulling the cord with the paws opens the door.
   e.) all of these

   Contiguity is an equally important factor that determines whether a behavior will increase or decrease. In the next demonstration, students in a course on learning were required to train a rat to pull on a rod to turn on a light and activate a lever that if pressed by the rat would result in a food reward. But these students violated the concept of contiguity and instead trained the rat to use its rear end to press the lever (wrong end!). Watch the clip “Contiguity” (select Assignments Menu → Assignment 2 → click on Contiguity).

16.) Based on this demonstration, which of the following applies to the concept of contiguity?
   a.) Consequences (e.g., rewards) must follow the desired behavior.
   b.) Consequences (e.g., rewards) must be close in time for learning to occur.
   c.) The behavior that occurs closest in time to the reward will be more likely to occur in the future.
   d.) all of these apply

   You probably think you can do better. So lets find out. We have programmed a simulated rat into your computer. Your mission is to train the rat to press the lever to obtain a food reward. To see what the final behavior will look like select Assignments Menu → Assignment 2 → click on Shaping). Make sure your volume is up on your computer but not too loud.

   Now that you know what the final behavioral goal is lets get started. In order to train a complex behavior like lever pressing you must break it down into smaller steps. Psychologists use the term shaping to describe this process (shape a behavior). Shaping involves rewarding the simplest approximation of the behavior until the behavior is established and then rewarding successively closer approximations of the behavior (called successive approximation) until you have taught the subject the complete behavior. Think of learning to ride a bike and shaping as the training wheel stage. So think about what you need to reward first and then increase the stakes. But remember once you start rewarding a closer approximation of the final behavior never go back and reward an earlier behavior or you will get a dancing rat (i.e., remember the concepts of contingency and contiguity).
Get started training your rat. Select **Shaping** from the **Experiments Menu**. The instructions for training a rat and using the software appears in the text box in the upper right hand corner of your laptop screen.

Follow the instructions in the Protocol to shape a rat until it makes 60 bar presses on its own to obtain food. After you reach this goal save your rat (Save is found under the popup menu “List of Trained Rats”) and then proceed to the next step below.

If you trained your rat to make at least 60 bar presses then congratulations! If not, then start over with a new rat and keep trying until you are successful. You cannot move on the next step unless your rat has made at least 60 rewarded responses. Be sure to save your rat before moving on (Save is found under the popup menu “List of Trained Rats”). Record your data in the table below.

Now let's look at some important forces that direct our behavior. At this point your rat has been trained on a continuous reinforcement schedule (CRF) or a Fixed Ratio of 1 schedule (FR 1). That is your rat received one food reward each time she pressed the lever. That sounds fair but what happened during training?

17.) **While on a CRF schedule the rat?**
   a.) Quit working as soon as it was full.
   b.) Stopped working each day after about 30 responses.
   c.) Required several days to reach criterion
   d.) all of these apply

Ok, but what happens if you stop paying her to work (extinction)? Select **Extinction** from the first (Experiment) popup menu. Record the number of responses made during extinction.

<table>
<thead>
<tr>
<th>Schedule Type</th>
<th>Number of Bar presses during training session</th>
<th>Number of Bar presses during extinction session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRF/Shaping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Interval 60 seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Ratio 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable Ratio</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It did not take long before she quit working. But in the real world people don’t get paid for every work related behavior. It would not be economical for the employer. So what keeps us working? The answer is that we are not on a CRF schedule of reinforcement. Let's examine the different schedules of...
reinforcement and their impact on your behavior. **Note: each time we change schedules be sure to go back and reload Rat 1. Don’t save your rat any more or you will have to start over and train a new rat.**

Change the popup menu listing of your rats to **List of Trained Rats** and then change it back to **Rat 1**. This will reset the subject to Rat 1. Now select **Fixed Interval** from the **Experiment popup menu** and then click on the **next session** button (be patient your rat is now an hourly worker actually she will be paid by the minute in this example).

The rat hippocampus is very good at timing. Rats will start responding a few seconds before the reward period begins and stop as soon as the reward period is over (people do the same thing and work hardest on payday). When your rat is full select **Extinction** from the first popup menu. Record the number of responses made when the rat quits responding in your data table above.

18.) **Compare your rat’s performance while on the CRF schedule to the Fixed Interval schedule.**
   a.) My rat worked a lot longer and harder during extinction (without pay) when placed on a fixed interval schedule compared to extinction on a CRF schedule.
   b.) My rat worked a lot longer and harder during extinction (without pay) when placed on a CRF schedule compared to extinction on a fixed interval schedule.
   c.) My rat worked about as long during extinction as they did following CRF training.

   We were able to increase the amount of work your rat would do without reward before giving up simply by changing the schedule of reinforcement to a schedule based on time (e.g., like the minimum wage or a fixed amount of money per hour). But we can also increase performance by increasing the ratio of behaviors to work (e.g., as is common in the garment industry where workers are paid a fixed amount of money in exchange for a set number of products made). Lets move your rat to a Fixed Ratio 10 schedule. The rat will now get one reward for every 10 responses. Change the popup menu listing of your rats to **List of Trained Rats** and then change it back to **Rat 1**. This will reset the subject to Rat 1. Now select **Fixed Ratio** from the **Experiment popup menu** and then click on the **next session** button. When your rat is full select **Extinction** from the first popup menu. Record the number of responses made when the rat quits responding in your data table above.

Now lets turn our rat into a used car salesman or other employee who is paid on commission. Individuals paid on a commission do not know when they are going to be paid. For this reason, they have to work hard with every
customer every day. They can’t rest in the back room, take long lunches or pace themselves like an hourly (fixed interval) employee can. These individuals are on variable ratio schedule of reinforcement. So change the popup menu listing of your rats to **List of Trained Rats** and then change it back to **Rat 1**. This will reset the subject to Rat 1. Now select **Variable Ratio** from the **Experiment popup menu** and then click on the **next session** button. When your rat is full select **Extinction** from the first popup menu. Record the number of responses made when the rat quits responding in your data table above.

19.) Which schedule of reinforcement produces the greatest amount of work for the least amount of pay and also produces the greatest amount of work during extinction?
   a.) Fixed interval 60 seconds
   b.) CRF
   c.) Fixed ratio 10
   d.) Variable ratio
   e.) these all produce about the same amount of work

20.) If you want your employees to work the hardest, how should you pay them?
   a.) Hourly
   b.) Salary
   c.) Commission
   d.) these all produce about the same amount of work

Continued on the next page
Part 4. Behavior is the result of Both Operant and Classical Conditioning.

Many of our behaviors were acquired through a combination of both operant and classical conditioning. To illustrate this point we will use a simple demonstration that many of you may experience with your own dog. Try to identify the operantly conditioned behaviors and the classically conditioned behaviors in this example. Select Assignments Menu → Assignment 2 → click on Behaviors).

21.) Listed below are several behaviors, events and stimuli shown in the example. Indicate whether they are a conditioned stimulus, conditioned response, unconditioned stimulus, unconditioned response, or operant behavior.

The dog licked his lips when I raised my open hand.
The dog licked his lips when I slapped my leg.
Raising my open hand.
Slapping my leg.
The dog came to me when I slapped my leg.
The dog moved back to his starting place in the grass when I raised my open hand to belt level.

22.) Using Table 1 in chapter 2, identify the types of rewards or punishments used in this example.

“Sonny...good dog”
the dog treat given after a completed behavior

So in this example, the behaviors demonstrated by the dog involved both types of associative learning. If you stopped and thought about it, you could probably come up with several examples of your own behavior that involve both an operant and classically conditioned component (e.g., have you ever become sick after eating at a restaurant and now actively avoid the restaurant?).

Part 5. Errors in Human Memory and the Impact on Eye-witness testimony.

Elizabeth Loftus has done some remarkable work that has revealed some limitations of our memory with important implications for how law enforcement and the criminal justice system treats eye-witness testimony. In the next demonstration, a crime was committed during one of my lectures. The students
were unaware that this crime was about to happen. The camera was hidden in some books in the classroom to avoid tipping off the class. Watch the clip. Wait five minutes and then write down what you saw. Be sure to describe the man as completely as possible and the physical characteristics of the book that he stole. Because you have been tipped off your memory should be more complete than the class. Select Assignments Menu ➔ Assignment 2 ➔ click on Eye-witness). ONLY VIEW THE CLIP ONCE!

After you have completed your description of the events, log into D2L and complete the Survey “Eye-Witness” Surveys are found on D2L under Assessments→Surveys

Do not turn the page until you have finished the survey on D2L
The figure above is from the students who participated in the class. Each student was asked how certain they were of their accuracy (% certain on the Y axis) and then we scored the percentage of details that were correctly recalled from a paragraph that they wrote (% correct on the X axis). The data confirms what Loftus and others have repeatedly found.

Figure 1. There was not a significant relationship between % Correct and % Certain ($r(43) = -0.1262334, p > 0.05$).
23.) This figure shows that
a.) If a witness is very certain that they are correct their memory of a crime is usually very good.
b.) If a witness is uncertain that they are correct their memory of a crime is usually very poor.
c.) there is no relationship between a witness’s perception of their own accuracy and how accurate they really are
d.) none of these

In addition, many witnesses tend to fill in the blank’s of their memory with things that sound plausible. This tendency is called **confabulation.** Confabulation is not an intentional deception it is phenomenon that people naturally do when we can’t remember something. We are not even aware that we are doing it.

For example, normally my laptop is open and on the instructor’s bench. On this day it is not there. Twenty-five percent of the class said that my laptop was taken by the criminal. Most of those students were 100% sure they were right about the object that was taken! During our class discussion none were aware that they had been confabulating. They were sure that that’s what they saw.

Memories can also be implanted. Was the criminal a man or a woman? What color was the book they took?

If you agree that the criminal was a man you are wrong. It was a woman. In the instructions I planted the suggestion that the criminal would be a man. If you agree that she stole a book you were again influenced by my suggestion in the instructions. She actually took my blue lunch box. I planted the memory that the item taken was a book.

Because memories can be modified based on the way the questions are asked or based on the testimony of others law enforcement must be careful to interview witnesses individually without leading questions. Judges must keep lawyers from leading witnesses or making suggestions to witnesses. Specific details of crimes must be kept out of the media to avoid biasing jurors and witnesses alike.

Do these problems mean that we must throw out eye-witness testimony? Not at all. But when evaluating eye-witness testimony we must always keep in mind that human memory is prone to very specific types of errors.
You are now ready to complete the online questions for this assignment. Remember you only are allowed up to two attempts so if you do not feel ready go back and do the assignment over. It is your last score that counts. You will need this handout. Close your book and use the Respondus Browser to enter your answers in D2L (Assignment 2).

References
