



**OTRP** *online*  
office of teaching resources in PSYCHOLOGY

## **Problem-Based Group Activities for a Sensation & Perception Course**

**David S. Kreiner**

**University of Central Missouri**

Author contact information:

David Kreiner

Professor of Psychology

University of Central Missouri

Lovinger 1111

Warrensburg MO 64093

[kreiner@ucmo.edu](mailto:kreiner@ucmo.edu)

660-543-8076

Copyright 2009 by David Kreiner. All rights reserved. You may reproduce multiple copies of this material for your own personal use, including use in your classes and/or sharing with individual colleagues as long as the author's name and institution and the Office of Teaching Resources in Psychology heading or other identifying information appear on the copied document. No other permission is implied or granted to print, copy, reproduce, or distribute additional copies of this material. Anyone who wishes to produce copies for purposes other than those specified above must obtain the permission of the author.

**Problem-Based Group Activities for a Sensation & Perception Course**  
**David S. Kreiner**  
**University of Central Missouri**

**Overview**

I have incorporated 14 group activities into my Sensation & Perception course with the intent to provide a problem-based learning approach to the course. For each activity, students decide for themselves what information is applicable to a problem and formulate their own solutions.

Each of the activities is tied to the topic being covered for a particular week. After lecture and class discussion on the material, I randomly assign students to groups of three to four students. Each group then works on the assigned problem for approximately 20-30 min, followed by a brief report from each group to the class describing their solution.

Each activity requires approximately 30-50 min, making it suitable for most class periods. I have found that this works well for a class size of about 30 students. For larger classes, an increased number of groups would require either elimination of the group reports to the class or increased time to hear from each group. The only materials required are an instruction sheet for each activity and the self-assessment evaluation sheet, both of which are included in this document.

**Contents**

Assignment	Page
Introductory Project	2
Psychophysics Project	3
Dark Adaptation Project	4
Receptive Fields Project	5
Visual Pathways Project	6
Object Perception Project	7
Color Perception Project	8
Depth Perception Project	9
Motion Perception Project	10
Hearing Project	11
Auditory Perception Project	12
Speech Perception Project	13
Cutaneous Senses Project	14
Taste Project	15
Group Evaluation Sheet	16
Self-Assessment Sheet	17

## **Sensation & Perception Introductory Project**

### Problem

You have been invited to visit a high school psychology class. The teacher has asked you to help the class understand some basic concepts from the sensation and perception chapter. The class has not yet covered anything about sensation and perception. Your job is to develop a lesson plan to help the students learn the definition of perception and the concept of transduction. Try to develop creative ways to help the students understand these two concepts.

### Report

Your lesson plan should be a brief (approximately one page) outline including the following:

1. A specific activity for teaching the definition of perception.
2. A specific activity for teaching the concept of transduction.
3. A short assessment activity (e.g., quiz, writing assignment) to give the students feedback about whether they understand the concepts.

Your group will need to discuss your lesson plan with me.

## Sensation & Perception Psychophysics Project

### Problem

You have been hired as a research consultant by a beverage company. The company wishes to market a sports-drink to compete with beverages like Gatorade<sup>®</sup>. You are hired specifically to make recommendations on the following:

1. How much flavoring should be included in the recipe? The amount of flavoring should be enough that people will taste it but not enough that it will be overpowering.
2. How much salt (and similar ingredients) should be included? The salts are necessary to make the drink effective, but they do not taste very good. The beverage company wants to include some salts, but not enough to make the beverage taste bad.
3. How should the drink be packaged? This includes issues such as the size and shape of the bottle and the color of both the liquid and the package.

Your assignment is not to make specific recommendations on these questions, but to design psychophysical methodology that would provide good answers.

### Report

Your report to the class should include one example for each of the three question areas listed above. Do NOT try to address everything in this activity!

For **each** of your examples, you should do the following:

1. Describe the methodology, being as specific as possible (type of task, instructions to research participants, number and type of stimuli, analysis of responses).
2. Explain how you would use the results to make a recommendation.
3. Use correct terminology for psychophysical methods (e.g., method of limits)

## **Sensation & Perception Dark Adaptation Project**

### Problem

You may have seen road construction projects taking place during night hours. Use your knowledge about vision, and particularly about dark adaptation, to make recommendations to the highway department for the lighting that should be used around these construction sites.

1. What kind of lighting do you typically see at these road construction sites? Consider different characteristics of the light, such as intensity and wavelength. Think about the advantages and disadvantages of this type of lighting.
2. What kind of lighting would be optimal for these construction sites? Consider the goals of the lighting in terms of maximizing both worker safety and the ability of the workers to complete the construction.
3. Think about the ability of drivers to see and react to workers. Based on Signal Detection Theory, analyze the situation in terms of hits, misses, false alarms, and correct rejections.

### Report

Prepare a brief recommendation to the highway department. Your recommendation should include the following:

1. An analysis of the current lighting that is typically used, highlighting potential problems for worker safety and the ability to complete the construction. Use the terminology of Signal Detection Theory as part of your description of potential problems.
2. A set of recommendations for improving the type of lighting that would be used. Explain the reasoning for each recommendation you make.

## **Sensation & Perception Receptive Fields Project**

### Problem

The concept of receptive fields is sometimes difficult to grasp. Your assignment is to develop a live action simulation of a neuron's receptive field.

1. Select a neuron and the type of receptive field that you want to simulate.
2. Plan a way to show different patterns of stimulation in the environment. For example, one of your group members might hold up a sheet of paper containing a line at different orientations and at different locations.
3. Plan a way to simulate the responses of the neuron to different patterns of stimulation. For example, one of your group members might make clicking noises to indicate messages sent by the neuron.

### Report

Your group will perform your simulation for the class. Please keep the simulation to only a few minutes. At the end of your performance, ask the class to guess two things about your neuron:

1. Where is the neuron located (e.g., retina, lateral geniculate nucleus, striate cortex)?
2. What is the neuron's receptive field?

## **Sensation & Perception Visual Pathways Project**

### Problem

Design a series of questions that could be asked about the nature of a person's visual perception problems that could help identify the area that might be damaged.

### Examples of visual perception problems:

Complete loss of vision – one eye  
Complete loss of vision – both eyes  
Loss of vision on the right side of the body  
Loss of vision on the left side of the body  
Loss of color vision  
Blurred vision  
Loss of night vision  
Loss of peripheral vision  
Loss of ability to perceive motion  
Loss of ability to recognize objects

1. Think about how to determine whether the problem is occurring in the eyes or in the brain.
2. If the problem is in the eyes, think about how to determine whether it is an optical problem or a neural problem. If it is a neural problem, how can you determine what neurons on the retina might be affected?
3. If the problem is in the brain, think about how to determine whether it is in the What (Ventral) pathway or the How (Dorsal) pathway, and then how to narrow down the particular area that is most likely to be affected.

### Report

Prepare a list of questions that satisfies the requirements described above. For each question, indicate what each different answer would suggest.

## **Sensation & Perception**

### **Object Perception Project**

#### Problem

A new form of space travel will allow astronauts to explore planets in other solar systems. NASA is concerned about the ability of astronauts to correctly perceive the environments on these alien planets. Your job is to design a brief guide that can be used to help astronauts evaluate their perceptions when they are exploring these planets.

1. Consider the importance of top-down processing. How will you educate the astronauts on how top-down processing may affect their perceptions on a different planet?
2. To what extent will Gestalt strategies be helpful or harmful in terms of correctly perceiving objects and patterns?
3. Obviously it will be important to correctly segregate figure and ground. What cues should the astronauts look for to help with figure-ground segregation?

#### Report

Develop a one-page training guide for astronauts. Be prepared to summarize this for the class.

1. Start with a brief explanation for the astronauts of why their perceptions may be inaccurate.
2. Address each of the three areas above, using specific information from the textbook about object perception.
3. You may also include advice on any additional issues that might be helpful for this task.



## **Sensation & Perception**

### **Color Perception Project**

#### Problem

Emergency vehicles such as ambulances and fire trucks should be easily visible in a variety of lighting conditions. Your assignment is to develop recommendations on what color (or colors) should be used for emergency vehicles.

1. Consider the colors that are presently used for emergency vehicles. What do you think are the reasons that those colors are used? What are their advantages and disadvantages?
2. How can the color of an emergency vehicle make a difference? Use specific concepts about color perception from the textbook.
3. What factors can affect how easy it is to see various colors?

#### Report

Prepare a brief recommendation that could be submitted to a city council, ambulance district, or other agency. Be prepared to summarize your recommendations for the class. Your recommendation should include the following:

1. Advantages and disadvantages of the colors that are currently used.
2. Recommendations for colors that should be used.
3. Advantages and disadvantages of your recommended colors.

## **Sensation & Perception**

### **Depth Perception Project**

#### Problem

Your task for this assignment is to address how natural selection applies to depth perception.

1. How does natural selection work? How would this affect the way that perceptual processes operate?
2. How could natural selection have “programmed” our brains to use depth perception cues? (Consider the consequences if our ancestors did *not* use these cues or used fewer of them.)
3. You have read about some visual illusions. Why would evolution have resulted in a brain that is susceptible to illusions?

#### Report

Prepare a brief report to share with the class on your group’s discussion of these issues. Your report should include the following:

1. A brief explanation of how natural selection works and how it could affect perceptual processes.
2. A brief explanation of how depth cues in particular could have evolved through natural selection.
3. Your group’s thoughts on why the brain is susceptible to illusions.

## **Sensation & Perception**

### **Motion Perception Project**

#### Problem

Suppose an engineering team is trying to design a device that can be used by individuals with motion agnosia to help them navigate their environments. (Developing this device could also help improve the navigation abilities of robots.) You are hired as a consultant to provide advice on the types of information that this motion detector device will need to be able to process.

1. Consider the ways in which we rely on motion perception in our daily lives.
2. Consider the types of information that are needed in order to perceive motion correctly.

#### Report

Prepare a one-page list of the types of information that the motion detector device will need to be able to detect and analyze. For each type of information, indicate why this information is needed to help the person in daily life. Be prepared to summarize this for the class.

## **Sensation & Perception**

### **Hearing Project**

#### Problem

The Senior Center in your community has invited you to give a presentation on age-related hearing loss. Your job is to develop a short presentation about presbycusis.

1. Review the material from the textbook about the structure of the cochlea and think about the physiological reasons for presbycusis.
2. Think about what senior citizens would want to know about presbycusis and about how it might affect their daily lives.
3. Think of questions that you might ask about presbycusis if you were in the audience.

#### Report

Prepare an outline of your presentation (you will not actually make the presentation). Be prepared to report to the class on the content that your presentation would include.

1. Explain what presbycusis is and what the effects of it are.
2. Explain the physiological basis for presbycusis.
3. Prepare a list of questions that your audience might ask and what your answers would be.

## **Sensation & Perception**

### **Auditory Perception Project**

#### Problem

It is important for drivers (and pedestrians) to be able to hear emergency vehicles and to identify their locations. Think about situations where you could not see an emergency vehicle but you heard a siren, and you had to figure out where it was coming from so that you would know what to do (e.g., pull over to the side of the road). Your task is to develop recommendations for sirens on emergency vehicles.

1. Review the material from the textbook about pitch perception. How is the pitch of the siren important in helping people detect and identify it?
2. Consider what you have learned about sound localization. How can this be applied to locating the source of a siren?
3. Also consider the material on auditory scene analysis. How could people perceptually group sound information coming from the same vehicle?

#### Report

Prepare a brief recommendation that could be submitted to a city council, ambulance district, or other agency. Be prepared to summarize your recommendation for the class. Your recommendation should include the following:

1. Your recommendations for the sirens in terms of frequency, intensity, timbre, timing, and any other factors that you think are relevant.
2. A justification for each aspect of your recommendations. The justification should refer to specific material about pitch perception, sound localization, and scene analysis.

## **Sensation & Perception**

### **Speech Perception Project**

#### Problem

Why is speech perception so much easier for humans than for computers?

1. Think about the artificial speech recognition systems that you have encountered (e.g., automated customer service, dictation software). How do these systems compare to humans in speech perception ability? Consider both accuracy and flexibility.
2. How do humans solve the perceptual problems with speech? How does this compare to the way that artificial speech recognition systems work?

#### Report

Be prepared to summarize your responses for the class. Prepare a brief written report containing each of the following:

1. A summary of how artificial speech recognition systems compare to human speech perception. What are the strengths and weaknesses of these systems?
2. Based on your discussion of #2 above, an explanation of why humans are better at speech perception.

## **Sensation & Perception**

### **Cutaneous Senses Project**

#### Problem

Your task is to develop a list of consequences for the loss of cutaneous senses.

1. What are the consequences for a loss of ability to process touch information (pressure, texture, vibration)?
2. What are the consequences for a loss of ability to sense temperature?
3. What are the consequences for a loss of ability to sense pain?
4. What do these consequences suggest about how evolutionary pressures may have influenced the development of the cutaneous senses?

#### Report

Prepare a brief report outlining your responses to the four questions listed above. Be prepared to summarize your responses for the class.

## **Sensation & Perception**

### **Taste Project**

#### Problem

How can knowledge about the sense of taste be useful in the food industry? For this project, you will develop a list of concepts about taste that professional chefs should know.

1. Review the material in the textbook about taste receptors, the taste pathway, and the perception of flavor.
2. Also consider what you know about the sense of smell. What concepts about smell would be important for a chef to understand?
3. Consider differences between people in the perception of taste (e.g., supertasters). How could this information be useful to a professional chef?

#### Report

Prepare a list of concepts that could be included in a lesson on taste perception for professional chefs. Be prepared to summarize your list for the class.

1. List specific concepts that would be helpful.
2. For each concept, summarize the main point or points you would make about how it would be useful for chefs.



**Sensation & Perception  
Problem-Based Learning Activity  
Group Evaluation**

Your group must complete this evaluation form together. Each group member must be assigned a participation score from 0-2 using the following criteria:

- 0 = absent; or physically present but did not contribute at all
- 1 = minimal contribution
- 2 = contributed strongly

The participation score for each group member will be added to the group grade for the activity to determine each individual's grade for the project.

Name	Participation Score	Comments

**This section to be completed by the instructor.**

**Project demonstrates understanding of relevant concepts**  
 0 = not at all  
 1 = partly  
 2 = completely

**Project demonstrates creative application of knowledge**  
 0 = no  
 1 = yes

**Group Score: \_\_\_\_\_/3 maximum**

**Sensation & Perception  
Problem-Based Learning Activity Self-Assessment**

**Name:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Name of PBL Activity:** \_\_\_\_\_

Please rate how effective you feel this activity was in helping you learn about sensation and perception. Use a scale of 0-4 where 0 indicates *not at all effective* and 4 indicates *extremely effective*. \_\_\_\_\_

Please list specific skills or knowledge that you learned or improved upon as a result of this activity.