Teacher Guide for BLOSSOMS Lesson
Do You See a Ghost?
The Relationship between Afterimage and Color Sensors in Humans

The theme of this lesson is to examine the color sensor of humans. Students will learn how human can recognize colors.

This lecture aims at two types of goal. The achievement goal of the intellectual level is for students to learn about the stimulation of the cone cells. The achievement goal of the cultural level is for students to acquire skills to explain to others their views in an understandable way. To achieve these goals, students will have discussions and presentations in groups consisting of 4-5 students. The students do not need to study anything in advance to take this lesson. All materials required for this lesson are available on the web site of BLOSSOMS. This lesson takes about 45 minutes.

Following is a summary of each section.

Section 1 and Activity 1
Students will have an experiment to see an afterimage. Make sure that all students have seen an afterimage. If some students cannt see an afterimage, make sure the followings,
- Do not blink,
- Do not move head or paper,
- Right distance (20 cm / 8 inches) between face and paper.

Section 2 and Acrivity 2
Students will have follow-up experiments of afterimage using other colors. Let students use blue and purple first, and then pick a couple of other colors. After the experiments, students will share the result in their group. Direct them to write all results of group members on the sheet.

Section 3 and Activity 3

Assign each group member a number in the original group, then make new groups which consists of the same number. A new group has all the results of the original groups. Let students to share the results and try to find a rule behind the results. Some groups may not be able to find the rule. Please encourage them not to think that they have failed. They can not always find the rule in a short time.

Section 4 and Activity 4

After sharing the results in new groups, let students go back to the original group. In this section we explain the Three Primary Colors. In Activity 4 we want students to think about the relationship between the color they gaze upon and the color of the afterimage as relates to the explanation.

Section 5 and Activity 5

We explain cone cells and how people recognize colors. Because we explain using some new terms, please make sure that students understand the terms and the explanation. And please show the video again or give an additional explanation if needed.

In Activity 5, students pick another color and explain the afterimage phenomenon in the group. Please guide students to explain that using terms they learned in section 5. After explaining in each group, assign one student in each group to present the result to the entire class. It is a good idea to assign different colors before the presentation in order to prevent from overlapping in color.

It is also a good idea to prepare a circle color chart to explain colors other than red, green blue, yellow, magenta and cyan which we've explained.

Section 6

We explain the color sensor of human in this video. For an advanced

lecture, you may explain the color sensor of other animals. If you have enough time to discuss, please ask students a question about this theme.