

## Seeing Red IV – The Color Red

### Teacher's Notes

Students will need to complete this activity in a computer lab with Internet access. You should familiarize yourself with the applet that students will use for this activity. It is located at <http://www.shodor.org/interactivate/activities/AdjustableSpinner/>. In advance of this class activity, you should work through the practice steps that students undertake on their activity sheet so you are prepared for any questions they might have.

Prior to this class activity, you may want to review the results obtained from the student sampling undertaken in **Seeing Red II**. Using these results, determine an estimated proportion, rounding to the nearest tenth, of the red books in the library. For example, suppose that the majority of your students' proportions range from 0.24 to 0.33. Then you would use  $p = 0.30$  as the librarian's conjectured proportion.

You also will want to meet in advance with your school's librarian or one of the library staff who can visit your class for a few minutes to play the scripted role in Part 1 and Part 2 of the student activity. Share with the librarian the proportion that you determined above from the prior student results. Point out that the librarian should first make an implausible statement, using  $1 - p$ , as the belief. Then allow students a few minutes in small groups to discuss the librarian's claim. Many students may claim that the librarian's value is not believable, as the value will be drastically different from earlier students' results.

Following a short class discussion, the librarian then corrects the supposed proportion of red books in the library using the proportion you supplied. Following a collective sigh of relief from students, the remainder of this activity centers on determining if the librarian's claim is plausible.

One component of this activity is producing a single estimate of the proportion of red books in the library for the entire class. Find the total number of books in all student samples and the total number of red books in all student samples, then calculate the combined class estimate of the proportion of red books in the library.

Choosing several of the proportions obtained in the previous activity by individual students or teams, you can illustrate that the value of the sample proportion will vary from sample to sample under the same conditions. It is interesting to point out one or two student samples that resulted in a sample proportion close to the librarian's conjecture, but a few other student samples in which the values differ by fairly large amounts from the librarian's claim. The key point to bring out in class discussion is that randomness contributes to sampling variability and that sampling variability is a natural outcome. One way you might wish to illustrate this in class is to ask two different students to plot in one graphical display (in a different color for each student) the 10 values of the sample proportion obtained from their respective simulations.

Here is an excellent opportunity to compare outcomes of the various random samples to examine variability based on sample size. Construct a dot plot of the proportions obtained by students from the simulations in this activity. If you saved your class dot plots from the previous activity of the  $n = 50$  and  $n = 100$  sample sizes, this would be a good time to bring those out. Compare these earlier dot plots to the dot plot of the simulations' results and discuss with the class the effects of a large sample size on the variability of the sample proportion.

You may wish to pass around the sheet provided at the end of these notes so that students can record their results for later use.

