Human Parallel Computer - Data Parallelism through Forest Fire Simulations

Goal:

This lesson is designed to model a "data parallel" algorithm (same task, different data). We will create a "human parallel computer" by running a bunch of simulations of the spread of a forest fire and collecting the results. Each student has the same task to complete, with different data being processed by each student.

Materials:
- Computer connected to the Internet, 1 per student and 1 for the instructor.
- Small scraps of paper, 2 per student.
- Parallel Computing Notebook, 1 per student.

Activity:
1. The instructor assigns each student a unique number, starting at 1, and increasing consecutively.
2. Each student does the following:
    a. Google "Shodor Fire"
    b. Click the link for "Interactivate: Fire!! - Shodor"
    c. Create a fraction by dividing your number by the total number of students. This is your burn probability.
    d. Type your burn probability into the box and press enter. The fraction should change to a decimal.
    e. Click the "Highlight Center Tree" button.
    f. Using 1 piece of paper, do the following, 5 times:
        i. Click the center tree and watch the forest burn.
        ii. When the fire stops, write down the percentage of trees burned and the number of iterations the fire lasted.
        iii. Click the "Re-grow Forest" button.
        iv. Repeat
    g. Using a second piece of paper, write down the following:
        i. Unique ID
        ii. **Average** of percentage of trees burned.
        iii. **Average** of number of iterations.
    h. Pass the paper to the instructor.
3. The instructor receives papers from the students, types in the results, and graphs them.
4. Each student writes out the steps taken during the exercise.
5. The whole group discusses the questions:

Questions to Answer in Your Parallel Computing Notebook:

1. What were some of the **tasks** we did in this exercise? What were they, and who did them?
2. What kinds of **data** did we work with in this exercise?
3. In which steps was there **communication** or **message passing** during this exercise (mark these steps)?
4. In what ways could this exercise have been **optimized** so it could take less time?
5. How could we have run this exercise using two instructors instead of one?