***Lesson Plan Template SP4***

Adapted from: Smith, Margaret Schwan, Victoria Bill, and Elizabeth K. Hughes. “Thinking Through a Lesson Protocol: Successfully Implementi ng High-Level Tasks.”

*Mathematics Teaching in the Middle School 14* (October 2008): 132-138.

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| **PART 1: SELECTING AND SETTING UP A MATHEMATICAL TASK** | |
| What are your mathematical goals for the lesson? (i.e., what do you want  students to know and understand about mathematics as a result of this lesson?) | Students will construct a histogram based on their data after an experiment. |
| What are your expectations for students as they work on and complete this task?   What resources or tools will students have to use in their  work that will give them entry into, and help them reason through, the task?   How will the students work—  independently, in small groups, or in pairs—to explore this task?   * How will students record and report their work? | Visually represent their data with a histogram on the resource page.  Students will need to make an origami frog in advance or use real or plastic frogs.  Directions on how to make an origami frog are at:  <http://www.origami-fun.com/support-files/origami-jumping-frog-print.pdf>  pencils, markers, rulers, meter stick, 3 x 5 inch index cards  partners  Using resource page to share with the class their histogram |
| How will you introduce students to the activity so as to provide access to *all*  students while maintaining the cognitive demands of the task? | Show this video clip below of a frog jumping contest that occurred in Calaveras County.  <http://www.youtube.com/watch?v=uTJAsZP2iLk>  Hand them a resource page about the directions for their task. |

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| **PART 2: SUPPORTING STUDENTS’ EXPLORATION OF THE TASK** | |
| As students work independently or in small groups, what questions will you ask to—   help a group get started or make progress on the task?   focus students’ thinking on the  key mathematical ideas in the task?   assess students’ understanding of  key mathematical ideas, problem- solving strategies, or the representations?   advance students’ understanding  of the mathematical ideas? | -Can you make a prediction in centimeters how far your origami frog will jump?  -How will you organize the 12 trials that you and your partner need to perform?  -Is there another way you could have created your histogram?  -Can you explain that to me?  -How comfortable are you measuring in centimeters? Can you draw a 5 cm line?  -Were you surprised by your data? |
| How will you ensure that students remain engaged in the task?   What assistance will you give or what questions will you ask a  student (or group) who becomes  quickly frustrated and requests more direction and guidance is  solving the task?   What will you do if a student (or group) finishes the task almost  immediately? How will you  extend the task so as to provide additional challenge? | Frustrated Students:  -What pieces of data does the question suggest that you need to collect?  -What would happen if you changed the size of the intervals? Compare intervals that are 20 cm apart versus 10 cm apart. Example: 0-10,10-20,20-30, etc. versus 0-20,20-40,40-60  -If your intervals are 10 cm apart and you had intervals 0-10,10-20 where would a frog’s distance of 10 cm go in which bin?  Extensions:  -Is there another way you could display that?  -Is there anything you could do to make your visual easier to understand?  -Can you find the mean, median, mode, range, and mean absolute deviation for your data.  -Using the class data, make another histogram.  -What is the experimental probability that your frog jumped between 10-20 cm as a fraction, decimal, and percent after the 12 trials. |

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| **PART 3: SHARING AND DISCUSSING THE TASK** | |
| How will you orchestrate the class discussion so that you accomplish your mathematical goals?   Which solution paths do you want to have shared during the  class discussion? In what order will the solutions be presented? Why?   What specific questions will you ask so that students will—  1. make sense of the  mathematical ideas that you want them to learn?  2. expand on, debate, and question the solutions being shared?  3. make connections among the different strategies that are presented?  4. look for patterns?  5. begin to form generalizations?  What will you see or hear that lets you know that *all* students in the class  understand the mathematical ideas that  you intended for them to learn? | Have students share in this order-(ish):  -list info.  -talk about why they chose the intervals that they did  -display their histogram  Questions:  -Who else used bin sizes like yours?  -Is there a better bin size a group could have used?  -What did you like about that?  -Is there another visual display that you could have used?  -In their experiment, how many frogs jumped between 10-20 cm (for example)  If these ideas below have been talked about before, other questions are:  -Just by the looking at the histogram, which measures of central tendency (mean, median, and mode) can you find.  -Can you think of another way to graph this data that you would be able to find the three measures of central tendency.    **Assessment**  use the data provided to create a visual display  circulate the room and observe students communicating with each other.  Students will begin independently and then work with a partner to share before sharing with the whole class.  The data should look visually nice so that a nice spread is shown. |

Name:

Date:

Frog Jumping Contest

Directions:

You got so excited about watching the frog jumping contest held in Calaveras County, that you decided to recreate the event with a frog of your own. You will need to use either the origami frog that you made or a plastic frog to complete this investigation.

Reminder the rules of the frog jumping contest are as follows:

1. Frogs must all start from the lily pad.
2. Distances are recorded after three jumps.
3. Distances must be recorded in centimeters from the center starting dot on the lily pad to the corner of the frog’s jump after their third jump.
4. You can only flip the frog over and may not change direction.
5. You may only press your one finger on the frog’s back to make it jump.
6. How far do you believe your frog will jump after three jumps in centimeters from the starting lily pad?
7. In an organized way, you and your partner must take turns measuring and recording your data for 12 trials. Each person will jump their frog 6 times while the other student measures in centimeters but both students should agree on the measurement.
8. Now on the graph paper below, you will construct a histogram based on your 12 trials.

Please remember the following expectations when constructing a graph:

1. All graphs have a title
2. All graphs have a vertical and horizontal axis label.
3. You must use a straightedge when constructing your graph.
4. Each axis must have labeled equal intervals.
5. The graph should be visually neat.

For your histogram, the intervals for the jump distances are shown on the horizontal axis and the frequency (number of pieces of data in each interval) is represented by the height of a rectangle bar above the interval.

After analyzing your data, please first decide an appropriate length for your intervals for the horizontal axis. Please keep in mind that we want to see a spread of your data. For example, two intervals would not suffice.

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