**Data Analysis Lesson Plan**

**Course/ Grade Level: Data Analysis and Probability**

**Common Core State Standards addressed:**

* HSS-ID.A.2 - Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
* HSS-ID.A.3 - Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
* HSS-IC.A.1 - Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
* HSS-IC.B.4 - Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
* HSS-CP.A.3 - Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.
* HSS-MD.B.7 - Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

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| **Goals:** Through the exploration of the cancer model, students will get a brief introduction to computer programing, and experience a hands-on approach to technology in mathematics. Similarly, students will witness the strong interconnection between biology and mathematics, even highlighting possible career paths for future pursuit. Students will experience an example of data collection through computer simulations and discover how to apply that data. |
| **Objectives:** Students will use the information collected from the model and apply the data to standards addressed in the classroom, particularly central tendency, conditional probability, and graphing. Students will also affectively communicate mathematical ideas and conjectures in writing. |
| **Materials Needed:** Students will need computer and internet access unless the simulations are done on a projector in front of the room. Students will also need a worksheet, paper, pencil, coloring utensils, basic calculator, and protractor. |
| **Opening:** The teacher should pull up the model in front of the class and explain the biology information behind the simulation. After demonstrating how to set-up and run the model, allow the students a few minutes to “play”, adjusting the various setting and observing how it affects the colon crypt. |
| **Meaningful Activities:** Using the model to generate data, students will complete the accompanying worksheet, applying the above standards in a fun way. |
| **Closure:** Ask students to share any particularly interesting discoveries they found while manipulating the model. Start a brief class discussion on the difference between collecting data this way versus rolling dice or taking a survey: pros and cons? End with suggesting exploration into possible careers in mathematical biology. |
| **Homework Assigned:** Students should complete the remainder of the worksheet for homework if they were unable to complete it during class time. If time begins to run short, make sure students run all the necessary simulations before answering the questions in case of limited internet or computer access outside of the classroom. |
| **Differentiation:** Particularly advanced students should be encouraged to explore the code. Can they figure out how to make the daughter cells red? What about the background color blue? |
| **Assessment:** The worksheet can be graded for correctness and completion. Students may wish to share any interesting discoveries from the model with the class  |

References:

National Governors Association Center for Best Practices, Council of Chief State School Officers, Common Core State Standards (Mathematics), *National Governors Association Center for Best Practices, Council of Chief State School Officers, Washington D.C.*, (2010).