

## Best Practices of Technology Integration

**Title:** *How Many?*

**Subject:** Mathematics (Probability & Statistics)

**Intended Grade Levels:** Middle School

### **Description:**

Have you ever wondered how many students in your school are left-handed? Have you ever tried to collect all of the prizes out of a cereal box only to find that you have six of the same prize? This lesson will help you mathematically determine your chances of accomplishing these tasks. This activity is intended to be used as an assessment tool after a unit on probability and statistics. It could also be used as a way to develop their understanding of probability and statistics. The students will be asked to problem solve two questions posed to them by the teacher and design ways of collecting data through simulations and random samples. They will also be required to think critically about the information they have learned and create their own experiment to show how to interpret data. This activity is hands-on, shows the students how numerous data trials produce more accurate results. This lesson takes about a week, uses at least seven computers and refreshes the student's spreadsheet skills.

### **Narrative:**

Many statistics are given on events and conditions that happen in our life. These statistics are determined through a process that gives substance and significance to the numbers given. Knowing that process allows us to give events in our life structure of occurrence. After completing this lesson students will be able to make a decision on whether "luck of the draw" can be predetermined?

In the lesson, the students are required to design and implement various experiments to determine answers to questions. It incorporates various learning styles, such as visual, auditory and kinesthetic. It allows the students to work at their own pace and is designed so that it can meet the needs of all the students simultaneously. It also provides an opportunity for higher level thinking and an assessment of what they accomplished. Not only do they have to do the work, they have to evaluate and revise the work they did.

Technology is used in various ways in this lesson. It requires that the students have a base of knowledge in a spreadsheet application such as *Excel*, and presentation applications such as *Hyperstudio* or *PowerPoint*. The teacher or students can also choose to incorporate digital pictures into their presentation. Using these tools allows the students to explore programs that are also used outside of school in the real world. It also provides the students the opportunity to showcase their information in a creative way and quickly make connections to other students' data. The technology creates avenues for the students that would not be possible without it.

The lesson requires that both the teacher and the student accept new roles. The teacher becomes the facilitator, while the students become responsible for their own learning. The students are actively involved in the project and are required to problem solve and apply their knowledge. This lesson creates an opportunity for the students to produce meaning from their work and connect it to the real

world through the scenarios. Working in groups allows for extended conversation about the process and collected information. The students should then be able to build upon their existing knowledge or build new understanding of the material. The lesson also allows the teacher to provide connections to various other areas of the curriculum.

**Curriculum Benchmarks:**

[MI.MAT.I.1.MS.2](#)

Represent and record patterns in a variety of ways including tables, charts and graphs, and translate between various representations.

[MI.MAT.III.1.MS.1](#)

Collect and explore data through observation, measurement, surveys, sampling techniques and simulations.

[MI.MAT.III.1.MS.2](#)

Organize data using tables, charts graphs, spreadsheets and databases.

[MI.MAT.III.1.MS.4](#)

Identify what data are needed to answer a particular question or solve a given problem, and design implement strategies to obtain, organize and present those data.

[MI.MAT.III.2.MS.3](#)

Draw, explain and justify conclusions based on data.

[MI.MAT.III.3.MS.1](#)

Make and test hypothesis.

[MI.MAT.III.3.MS.2](#)

Design experiments to model and solve problems using sampling, simulations and controlled investigations.

[MI.MAT.VI.1.MS.4](#)

Explain the difference between probabilities determined from experiments (empirical) or chance events and probabilities derived mathematically (theoretical), and explain how the empirical probability changes for a large number of trials.

[MI.MAT.VI.1.MS.5](#)

Conduct probability experiments and simulations to model and solve problems.

**Detailed Timeline:**

\*One week before the project starts get teachers permission to come into their class to do a sample (Day 3).

These activities should take about an hour each day.

- Day1-Introduce the project, students will design 1<sup>st</sup> experiment (simulation)
- Day 2-Perform 1<sup>st</sup> experiment, create rough draft of data and design 2<sup>nd</sup> experiment (random sample)

- ❑ Day 3-Perform 2<sup>nd</sup> experiment (make take longer than 1 hour or may need more than one day)
- ❑ Day4-Create rough draft of data for experiment 2 and plan out project
- ❑ Day5 to Day 9- Create presentation on *HyperStudio* and create graphs on spreadsheet program
- ❑ Day 10 to 11-Present projects to class
- ❑ Day 12-Discuss presentations and fill out survey

### **Materials/Hardware/Software:**

A computer lab will be needed unless you have 6-7 student stations in your classroom. The computers must have a spreadsheet application (Excel®) and a presentation application (HyperStudio® or PowerPoint®). A large screen projection device is also used for the student presentations. Calculators may be necessary for some students, and the students may also need six-sided die, six different colored chips, or a six-sectioned spinner to carry out their experiment.

### **Teacher Preparation:**

The teacher should know how to use the spreadsheet application to create bar graphs. They must also have some knowledge of HyperStudio® or PowerPoint®. A digital camera can be used, if so the teacher should know how to use it. The teacher should also be aware that the students might choose to do their random sample by surveying classrooms. If this occurs, the teacher will have to get permission from their colleagues to disturb their classes. Be sure to do this in advance (at least a week) so that adjustments can be made if necessary. The teacher should also know the population of the school. The teacher may also have to supply six-sided die, spinners or other materials necessary for the students to perform their simulation.

### **Prerequisite Student Skills:**

This activity is designed to be used at the end of a probability and statistics unit. The students at this point should know the workable definitions to probability, experimental probability, simulation, trial, random sample, population, etc. The students should also already know how to create bar graphs and tally charts. They will also need to have knowledge of a spreadsheet application (Excel®) that you will be using and know how to use HyperStudio® or PowerPoint®.

### **Activities/Procedures:**

Approximately 12 days (1 hour/day)

#### Day 1: Introduce Project and create first experiment

Pose these situations to the students:

“Suppose your favorite cereal is offering a prize in every cereal box. They are going to be valuable, but only if you collect all six prizes they have offered. Of course, you want all six prizes to complete your set. How many boxes of cereal are your parents going to have to buy in order for you to collect all six prizes.” (This scenario can be changes to Happy Meals, Pokemon cards, etc.)

“The gym teacher needs to purchase new softball mitts for gym class. She needs to know how many right handed mitts to buy and how many left handed mitts to buy. How many right handed and left handed mitts should she purchase?”

Explain to the students that we will be performing two experiments to determine the answers to these questions. They will choose how to collect the data and then put that data into a presentation form, using PowerPoint® or HyperStudio®, including the graphs from the spreadsheet application (Excel®).

Place the students into groups of 2-4 students. (2 works well, but depending on the amount of computers you have; you may need larger groups.) Have them discuss and decide how they can determine how many boxes of cereal their parents would have to purchase to collect all six prizes.

### Day 2: Perform Simulation

Have the students perform their simulation for at least five trials. Have them record their data in a tally chart of their own design and make a bar graph of the data. They should find the average number of cereal boxes needed and create a bar graph of that information. The graph should include a title, correct labels for the x-axis and y-axis, and a bar showing the average number of boxes needed. When they have completed this, the students can decide how they determine the number of right and left handed baseball mitts the gym teacher will need to purchase.

### Day 3: Perform Random Sample

Have the students perform their sample for the school. They should record their data in a tally chart and make a graph of the data the same way they did for the cereal box experiment (See day two).

### Day 4: Plan Presentation

The teacher should pass out the rubric and planning sheets and go over the requirements for their presentation with the students. The students should take the information they collected from the random sample and use it to predict (mathematically) how many students in the school are left and right handed. They will need the school's population to do this. They should then create a graph of their information. The graph should have a title, correct labels for both axes and two bars representing right and left handed students. They should then plan out their HyperStudio® project using the sheets provided and the rubric as guidance for the number of cards and requirements. The students have the creative freedom to choose how their cards are set up and what pictures (digital or otherwise) should be added, as long as they meet the requirements on the rubric.

### Day 5 to Day 9: Create Presentation

The students will use the next four days to create their presentation. They should follow the rubric provided by the teacher. It should state the questions asked how they determined their answers and what their results were. The students should use a spreadsheet program to show their graphs.

### Day 10 to Day 11: Presentations

The students will present their project to the class and the teacher. The teacher should use the rubric as a guideline for grading required elements.

### Day 12: Recap

Recap the information that the students presented. Discuss further possibilities and uses for this information. Survey the students to determine what they liked and did not like about the experiments and presentation, and find out how they would change it.

### **Assessment/Evaluation:**

This will be done both informally and formally. Informal assessments can be done by monitoring class discussions. Are students staying on task? Are they contributing to the discussion? Formal assessment can be done through journal writing, discussing and answering the focus question “Can luck be predetermined?”. Formal assessment will also be done through the presentation of the students’ data and will follow the rubric provided. Assessment should also be done on the project. A survey can be given to the students to determine what they felt went well and what did not, what should be done differently, and what they learned from these experiments.

### **Follow-up Activities:**

This lesson could be further extended by:

1. Creating a spreadsheet and graph that shows how combining all of the student data creates even more accurate results.
2. Determining why there are polls taken in politics and how those affect the candidates running for office.
3. Applying the information collected to a larger audience (the world).
4. Connecting the activity to science, by creating and collecting data on a scientific experiment. Answering the question of why scientists repeat various experiments.

### **Submitted By:**

**Name:** Dawn Berendt  
**School District:** Chippewa Valley  
**School:** Wyandot Middle School  
**Address:** 39490 Garfield Road, Clinton Twp. MI 48038