atlas ABE Teaching & Learning Advancement System
HAMLINE UNIVERSITY

Unit Overview

Instructor/Program: Kerin Hanson Bemidji ABE **Course/Setting: Science/Math GED/ASD**

NRS or CCRS Level(s): D **Unit Theme:** Using Scientific Method and Graphing with Data Analysis **Length (e.g., hours, days): 3 classes (4.5 hours)**

Rationale for this Unit: (Why is this unit important to my students?)
Students will need to use their Scientific Method skills and graphing abilities in their future careers as they work to problem solve situations.

Instructional Objective(s):
SWBAT design and carry out an experiment, analyze the data, and come to a conclusion based on the data they gathered.
SWBAT identify different types of charts and graphs and be able to create one with a set of data

Coherence:
Prerequisite or foundational content students need to succeed in the lesson:
1.MD.4, 3.MD.3, 6.SP.2, 6.SP.4

Description of how the content of the lesson is related to other content taught at the lesson's level:
Understanding ratio, percent, and probability

Description of how content connects to future learning:
Ties into how students can use data to determine trends in data and come up with slope and predictions of what the data will do.
8.SP.1, S.ID.1

Focus:
CCR Standard(s):
Primary Standard(s) (1-2 per lesson) :
Math:
6.SP.5 Summarize and describe distributions.

Supporting Standard(s):
Math:
7.SP.5 Understand probability of a chance event is a number between 0 and 1 that expresses likelihood of an event occurring. The larger the number the better the chance
7.SP.6 Investigate chance processes and develop, use, and evaluate probability models.
Writing:
Anchor 2: W/WHST.9-10.2 Provide a concluding statement or section that follows from and supports the information or explanation presented.

ACES TIF Skill(s):

EC, LS, CT, SM, NS

Northstar Digital Literacy Standard(s):

Excel Spreadsheet

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Components of Rigor:

☒Conceptual Understanding ☒Procedural Skill and Fluency

☒ Application

Additional Content Standards or Skills: (e.g. career, science, social studies, etc.)

Scientific Method

Standards for Mathematical Practice: *Only select the 2-4 practices that are central to the lesson*

☒MP 1: *Make sense of problems and persevere in solving them*

☒MP 2: *Reason abstractly and quantitatively*

☒MP 3: *Construct viable arguments and critique the reasoning of others*

☐MP 4: *Model with mathematics*

☐MP 5: *Use appropriate tools strategically*

☒MP 6: *Attend to precision*

☐MP 7: *Look for and make use of structure*

☐MP 8: *Look for and express regularity in repeated reasoning*

Level(s) of Knowing:

☒Intuitive: *Linking to what students already know*

☐Concrete: *Moving manipulatives*

☒Pictorial: *Drawing pictures*

☒Abstract: *Writing with symbols and numbers*

☐Application: *Applying to different situations*

☒Communication: *Explaining concepts, process and/or solutions to others*

Materials: Graph Paper, Notebooks, Paper Toss Excel Spreadsheet, Bar Graph Practice, Pie Chart Practice, Line Graph Practice, RERUN, Good Hypothesis vs. Bad Hypothesis, Masking Tape, Meter Stick, Waste Basket

Key Math Terms and Symbols:

Line Graph, Bar Graph, Pie Chart, Mean, Median, Mode, Range, Frequency, Probability, Controls, Dependent Variable, Independent Variable

Common misconceptions/misunderstandings by learners regarding the content that may interfere with learning:

All data points are important to trend lines and outliers do happen.

Adaptations and/or Accommodations: (How will EVERY student have access to the content of the lesson?)

Lesson lends itself to scaffolding and adapting to differing student needs. Students are working in groups to help teach each other learn concepts during independent practice. The topics of the lesson slowly build from the beginning to the end as a built in scaffold for student understanding.

	Academic Vocabulary and Additional Language Demands: (Non-math academic vocabulary and other language that may impact a student's ability to access the content in directions, examples, problems, etc.) Hypothesis, Control

Teacher Reflection

Notes for next time:

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Lesson Plan

Instructional Objective(s): *(Statements written in teacher language, derived from content standards)*	At the end of this lesson, students will be able to: 1. Identify different types of charts and graphs and be able to create one with a set of data. 2. Design and carry out an experiment. 3. Analyze the data and come to a conclusion based on the data they gathered.
Assessing Mastery of the Objective(s): *(Indicate <u>when</u> and <u>how</u> assessment will occur during the lesson - formative and/or summative)*	By the end of this lesson, the students will be able to create graphs and analyze them as evidenced by the students creating the graphs showing the results of their experiment.
Learning Target(s): *(Statements of what students will be able to do as a result of the lesson, written in student-friendly language)*	I can create the appropriate graph when given a set of data. I can determine the average of a set of data. I can design my own experiment. I can predict the probability of an event occurring.
Introduction:	1. Review steps to the Scientific Method 2. Review good hypothesis vs. Bad Hypothesis (Half-sheet handout – Other half of sheet will be used for experiment) a. Complete Individually, then turn to a partner and discuss your answers and why you chose them b. Class discussion about what's a good and bad hypothesis
Explanation & Modeling:	1. Discuss different types of graphs (Line, Bar, Pie) a. Show the different types of graphs on the projector screen b. What do you notice about each graph? i. Similarities and differences c. What do you think each graph is used for? d. What do all the graphs have? i. Title, labels, etc. 2. How to create a graph from a table (Notes together as a group)
Guided Practice:	Practice making different types of graphs (3 Practice sheets)
Independent Practice:	1. Present the problem (see paper toss experiment sheet) a. Discuss controls, independent variable, dependent variable 2. Have students write their own hypothesis in If/Then form

	3. Discuss procedures, number of trials, and materials needed 4. Give each student half a sheet of paper and have them grab the rest of the materials they will need 1 per group (Masking tape, meter stick, waste basket) 5. Set up data table for groups in Notebook 6. Run the experiment and have students collect data and create their group graphs 7. When they are done with data collection, have 1 member of each group input the data into spreadsheet on teacher computer and add it to the data graph on Excel 8. Look at and discuss how to calculate simple statistical data for each distance a. Mean, Median, Mode, and Range b. Have students calculate and then set up formula to check on Excel
Student Reflection on Learning Targets, Closure, & Connection to Future Learning	1. Look at Scatterplot of class data a. What do you notice (Trend in the data)? b. Add line of best fit c. Talk about how we could determine probability of making a shot from 4 meters based on best fit line. d. Talk about how we could use trend lines to predict oil and gas prices. 2. Have students write RERUN paragraph in their notebooks. 3. Have students write about one of the following questions prior to next lesson: a. The next time you encounter a problem in life, form a hypothesis about what the source of that problem might be. Perform some kind of test or experiment to see if your hypothesis is actually valid. Only after you have proven that the hypothesis is correct, come up with the solution. Notice to yourself what might have happened if you had not verified your hypothesis before acting. b. Do you play video games? Many modern video games require trial and error and the player to guess at what they are supposed to do next. Your hypothesis might be something like "if I open this door then I will get to the treasure." You would then test your hypothesis by opening the door and then analyze your results based on what happened ("there was a monster behind the door, opening it did not get me to the treasure"). c. Do you bake? When determining how long to bake cookies, for example, you are using the scientific method. Your hypothesis might be something like "if I bake a batch of cookies for 10 minutes then they will be perfectly cooked." You would then test your hypothesis by baking the cookies for 10 minutes and then checking on their progress.

		You would then analyze your results based on how they look after 10 minutes ("the cookies are burnt, it took less than 10 minutes to bake them" or "the cookies are perfectly cooked after 10 minutes").

Good vs Bad Hypotheses

Circle **good** *or* **bad** *for each hypothesis, and underline any terms that make a hypothesis* **bad:**

1. Students who own laptops have higher GPAs. **Good** or **Bad**

2. Murders occur more often during the full moon. **Good** or **Bad**

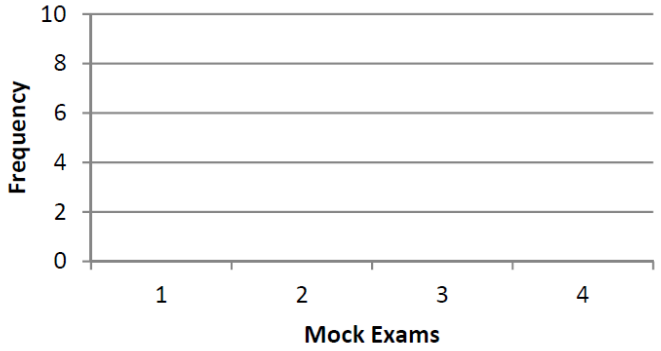
3. Cats are happier when you pet them. **Good** or **Bad**

4. Orangutans are smarter than gorillas. **Good** or **Bad**

5. Sea level will be higher in 100 year than it is today. **Good** or **Bad**

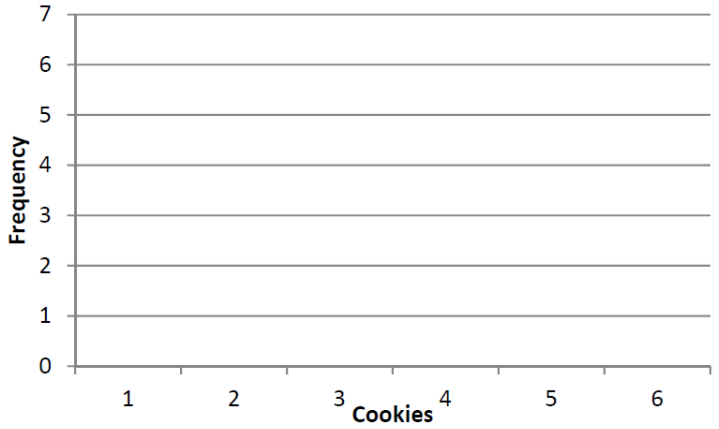
Maria takes different number of mock exams on each day of a month. The number of exams taken on each day are shown as below; she already organized them in order.
1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 4 4 4 4 4

Mock Exams	Frequency
1	
2	
3	
4	



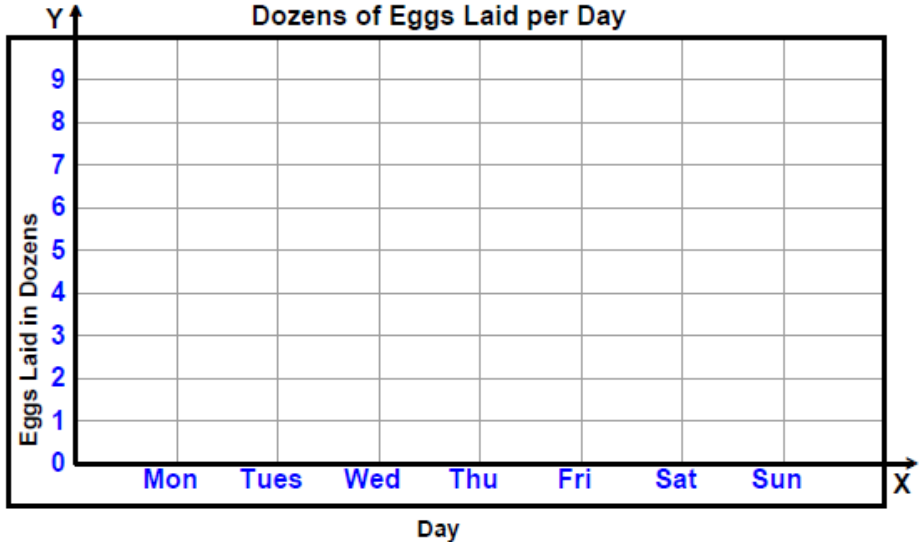
Stephen buys different number of cookies on 20 occasions. The results are shown as below; he already organized them in order.
1 1 1 2 2 3 3 3 3 3 4 4 5 5 5 6 6 6 6 6

Number of Cookies	Frequency
1	
2	
3	
4	
5	
6	



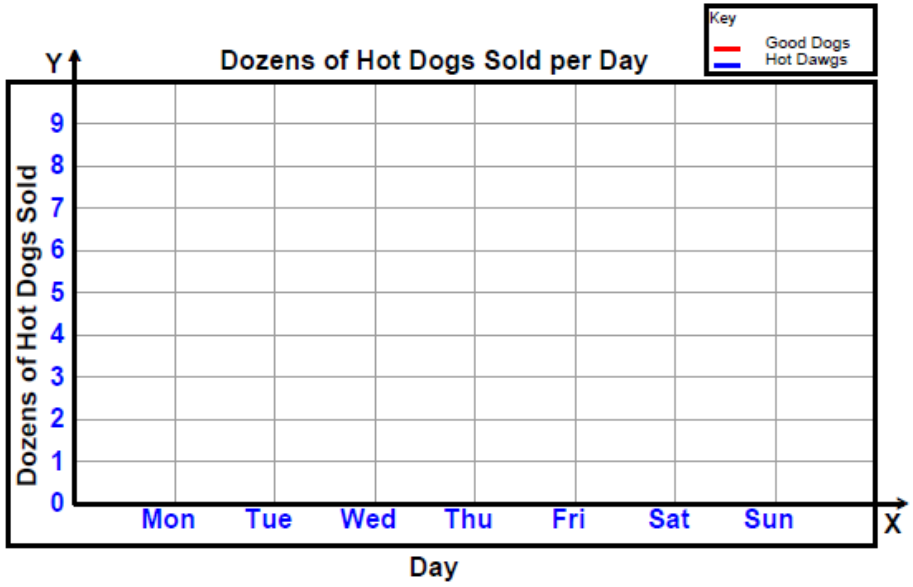
Graph the given information as a line graph.

Day	Eggs Laid
Mon	72
Tues	60
Wed	96
Thu	96
Fri	24
Sat	12
Sun	96



Graph the given information as a line graph.

Day	# of Hot Dogs Sold	
	Good Dogs	Hot Dawgs
Mon	96	96
Tue	72	12
Wed	60	36
Thu	84	48
Fri	36	24
Sat	48	72
Sun	12	84



Problem 1: The student council took a poll of 100 students and asked them to identify their favorite school subjects. Here is the data they collected. Display the data in a pie chart.

Math: 21	Science: 34	PE: 26	Art: 19

Problem 2: In a taste test, a grocery store asked customers to sample three kinds of peanut butter, and then rank their favorite sample. Display the data below in a pie chart.

Peanut Buster	Walter's Old Style	Big Chunk
23	39	14

Paper Toss Experiment

Materials needed:

Paper Garbage Cans (1 per group) Meter Sticks (1 per group)
Masking Tape

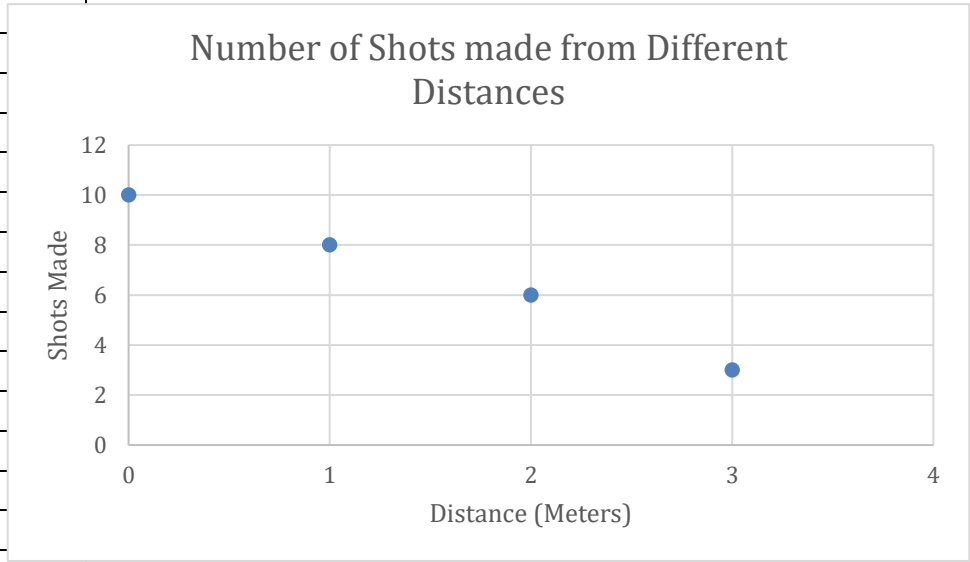
Get Started Activity:
Take a piece of paper and scrunch it up into a ball in front of the class. Grab a trash can and place it in front of the class. Walk a short distance, about a meter, away from the trash can, turn, and toss the ball toward the can. Tell the students that you are going to throw the paper 9 more times and they will need to keep track of how many baskets you make (including your first throw). After the tenth throw, move back another meter and repeat the process. Finally walk approximately 3 meters from the basket and attempt 10 more baskets. Create a table on the board with the results:

Name	Distance	# of Baskets
Teacher	1 meter	10
Teacher	2 Meters	8
Teacher	3 Meters	6

Experiment:

Divide the students into groups. Have each group gather a garbage can, 2 pieces of paper, a meter stick, and a long strip of masking tape. Each group should place their garbage can in the location that the teacher indicates. Next, they should use the meter stick and find a location that is 1 meter from the garbage can. They should mark this spot with masking tape. Then, measure and mark, with masking tape, a spot 2 meters from the garbage. Finally, they need to mark a spot 3 meters away from the garbage can. Have one student scrunch up a piece of paper while another creates a chart, like the one on the board, making sure that there are three lines for each group member. The students will then take turns tossing the paper, 10 times from each marked distance. All group member should work together to keep track of the number of baskets each person makes, and one person should record the results in the chart. Students should wait quietly for the teacher's directions once everyone has finished tossing the paper.

Number of Shots made from different Distances				
Name	0	1	2	3
Kerin Hanson	10	8	6	3



Conclusion Paragraphs: RERUN

R = **Recall:** Describe what you did briefly.

E = **Explain:** Explain the purpose of the study.

R = **Results:** State the results, including which hypothesis was supported by the study.

U = **Uncertainty:** Describe uncertainties that exist, if any.

N = **New:** Write two new things you learned.

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