**Unit 5: Investigation 2 (2 Days)**

**Introduction to Scatterplots and Trend Lines**

***CCSS:*** 8-SP 1; 8-SP 2; 8-SP 3; S-ID 6 a, c; S-ID 7

**Overview**

Students are introduced to scatter plots and trend lines, use the equation of trend lines to make predictions, and learn the meaning of interpolation and extrapolation. Students also develop a deeper understanding of slope by interpreting the slopes of trend lines.

**Assessment Activities**

**Evidence of Success: What Will Students Be Able to Do?**

Students will be able to fit a trend line to data, write an equation for the trend line, and use the equation to interpolate or extrapolate. They should be able to understand the contextual meaning of the parameters of the trend line equation. *If the students have not mastered these topics in two days, the upcoming investigations will reinforce these concepts.*

**Assessment Strategies: How Will They Show What They Know?**

**Exit Slip 5.2.1** asks students to determine the equation of a trend line and use it to make a prediction.

**Exit Slip 5.2.2** asks students to draw a trend line through points, determine the equation of their trend line, interpret the slope of the trend line in the context of the problem, and use the equation of the trend line to make a prediction.

**Journal Entry** prompts students to describe the difference between interpolation and extrapolation.

**Launch Notes**

You may begin this investigation by presenting the **Activity 5.2.1 Sea Level Rise** (PowerPoint). The presentation contains photographs of planet Earth and Glaciers in Alaska. Lead a class discussion on sea level rise and melting icecaps to increase their awareness of these environmental concerns and stimulate interest in the Sea Level Rise activity.

**Closure Notes**

Summarize the concepts that students learned in this activity by asking students to define the following terms: scatter plot, trend line, prediction, interpolation, and extrapolation. Point out that the predictions which arise from individually selected trend lines will vary because each trend line is different due to our individual judgments on what line is the best fit. In the next investigation we will learn about the unique line of “best fit” and how to find it using the graphing calculator.

**Teaching Strategies**

1. You my introduce **Activity 5.2.1 Sea Level Rise (**PowerPoint)prior to using the **Activity 5.2.1 Sea Level Rise** activity. The PowerPoint presentation presents students with the problem of predicting the change in sea level between 1888 and 2010, and between 1888 and 2020. Data are presented and the presentation models the process of fitting a trend line to data, finding the equation of the trend line, and using the trend line to make predictions.

When displaying slide 2 where the variables are defined, check that students understand the variable assignments and can correctly interpret the points in the table. Some students may have trouble understanding that the sea level is being measured since 1888, but the variable is being measured since 1900. You also can ask students whether they see any trends in the data.

Slides 5 & 6 prompt students to think about how a scatter plot or trend line can be used to make predictions. Explain to the class that drawing a trend line to fit data is analogous to taking a piece of raw spaghetti and laying it on the graph and adjusting it until it seems to fit the data. You may distribute spaghetti to the students so they can try it for themselves.

Slide 8 shows students how to find the equation of a trend line. Before showing students this slide, ask students how we can find an equation of a trend line. Mention that students can use slope-intercept form or point-slope form to find an equation.

Slides 9 & 10 present predictions from the trend line. Make sure that students understand that a prediction from a trend line is an estimate and is subject to a person’s selection of a trend line. You may also want to point out that the passage of time did not cause the sea level to rise. The distinction between correlation and causation will be fully addressed later in this unit.

Following the PowerPoint presentation, or during the presentation, you can assign students problems in the accompanying worksheet **Activity 5.2.1 Sea Level Rise**.

**Differentiated Instruction (For Learners Needing More Help)**

Provide students who have difficulty remembering formulas needed to calculate the slope and/or equation of a line a formula reference sheet as a memory aid. Or, students can maintain a “Formula Reference” section in their notebook that includes formulas used throughout the course along with examples of how to use the formulas.

During the course of **Activity 5.2.1** students will have learned that more than one trend line may fit a data set. The only criterion they have been given to find a trend line is in question 4 which states, “Find a line that comes as close as possible to the plotted points and has points on both sides of the line. “ In **Activity 5.2.2 Scatter Plots and Trend Lines**, students examine more precisely what this means. The first data set relates the heights and weights of 8 NBA superstars. Four different trend lines are drawn, and students must choose which one is best. Discuss the examples given and help dispel common misconceptions, for example that the line must pass through two of the data points or that there must be exactly the same number of data points on either side of the line. After discussion the class should agree that Student 4’s trend line is the best.

**Activity 5.2.2** gives students additional practice in finding the equation of the trend line from two points on the graph and using the equation to make predictions. Part of this activity may be assigned as homework.

**Differentiated Instruction (For Learners Needing More Help)**

Have students create a mnemonic device or “rap” for the steps in plotting data and calculating the equation of a trend line.

1. **Activity 5.2.3 Television, Homework and Test Scores** focuses student attention on making predictions from trend lines and understanding the distinction between interpolation and extrapolation. Introduce **Activity 5.2.3** by having the students predict the correlations of hours of TV watched and percent of homework completed, hours of TV watched and test scores, and percent of homework completed and test scores. After having students share their informal understanding of the relationship between these variables, instruct students to analyze some hypothetical student data.

**Group Activity**

Form groups of three or four. Have the students compare their trend lines by comparing the points they chose and their resulting equations. Then have students brainstorm about the definition of interpolation and extrapolation based on context clues. Have one person from each group write their definition on the board.

**Differentiated Instruction (For Learners Needing More Help)**

Have students make a procedure card that lists the steps calculating the equation of a trend line. Allow students to use the card.

For **Activity 5.2.4 Height and Shoe Size,** students collect data on their height and shoe size. The class data is then used to create a scatterplot and students find trend lines to fit the data. Students may provide an estimate of their height. If measuring devises are available, students can instead measure each other’s height. Students may want to keep their shoes on. If this happens you should mention that the height measurements will be less accurate.

At this point you may use **Exit Slip 5.2.1 or 5.2.2** to assess student understanding.

**Differentiated Instruction (Enrichment)**

Question 11 in **Activity 5.2.4** asks students to research the difference between women and men’s shoe sizes. Based on their research, they should come up with a recommendation on how to improve the analysis of the data based on these differences.

**Differentiated Instruction (Enrichment)**

You may choose to have students use the Internet to research the definition of the word *interpolation* and *extrapolation* in mathematics. They should obtain a definition from at least three websites and bring the definitions and each source to class the next day. Students may share their definitions in small groups and then write a definition in their own words to share with the class.

**Differentiated Instruction (Enrichment)**

Have students come up with data about a relationship they are interested in. For example, the number of calories and grams of fat in breakfast cereals. Suggest that they use the Internet to find data. They should create a scatterplot, draw a trend line, find the equation of the trend line, and use the trend line to interpolate and extrapolate.

**Journal Entry**

Describe the difference between interpolation and extrapolation. Which do you believe is more accurate and why? Which do you believe is more useful and why? Your response should be at least 5 sentences.

**Resources and Materials**

* **Activity 5.2.1 –** Sea Level Rise
* **Power Point for Activity 5.2.1 –** Sea Level Rise
* **Activity 5.2.2** – Scatter Plots and Trend Lines
* **Activity 5.2.3 –** TV Watching, Homework and Test Scores
* **Activity 5.2.4 –** Height and Shoe Size
* **Exit Slip 5.2.1**—Barometric Pressure
* **Exit Slip 5.2.2–** College Students
* Bulletin board for key concepts
* Student Journals
* Raw spaghetti
* Measuring tapes or yard sticks
* Computer & Projector
* Rulers