**Total Time needed 60 minutes**

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| **Handouts:**   * Understanding R-Squared Task | **Materials:**   * TI-Navigator * TI-Nspires * ***Understanding R-Squared StaRT.tns*** * Nspire QuickPoll documents ready to go. |

**Objectives**

The students will develop a conceptual understanding of R-squared as a measure of the effectiveness of the LSRL in eliminating the variability in the response variable.

**Section 1 (5 minutes)**

Send the Nspire file to the students and ask them to read page 1.2. The main purpose of question 1 is to clarify that the squares represent squared residuals. The teacher should guide a discussion towards this goal.

*The graph on page 1.3 displays a scatterplot of (x,y) ordered pairs and a moveable line (the black line). The magenta line represents the average y value for the points in the scatterplot.*

1. *What do the squares on page 1.3 appear to be measuring?*

Anticipated responses

* The students might struggle to see the residuals.
* Furthermore the geometric representation of squaring a quantity might be foreign to some students.

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**Section 2 (10 minutes)**

Next tell student to process through the file and answer questions 2 and 3.

*Position your cursor over the middle of the black line and shift it so that it overlaps the magenta line. Observe the changes in the areas of the squares.*

1. *What conjectures can you make about the position of the line and the total area of the squares?*

*Now, return to the previous page and rotate the black line so that it follows the linear trend in the data and observe the changes in the areas of the squares.*

1. *Did your conjectures change regarding the position of the line and the total area of the squares?*

After the class has had an opportunity to make and revise conjectures, send a **QUICKPOLL** to capture one conjecture per student. Lead a discussion pertaining to the validity of these conjectures. In particular, ask students if they can find counterexamples or if they support the conjectures.

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**Section 3 (5 minutes)**

Students should now answer question 4. The teacher should guide a discussion towards answering this question.

*In statistics, the line of best fit for a scatterplot is formally called the* ***Least Squares Regression Line (LSRL)****.*

1. *Explain how your conjectures from the previous question support this formal name.*

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**Section 4 (60 minutes)**

Next, the students will observe the changes in boxplots representing the overall variation in y and the remaining variation in y after using an LSRL. A primary goal is that they notice the variation in y is minimized or “explained” by using the LSRL line instead of the one-dimensional average y.

*The graph on page 1.6 displays a scatterplot, a magenta line representing the average y value, and a green line representing the LSRL. On the right, you will find boxplots representing the variation in y-values when compared to these two lines. Move the points and observe the changes in variations.*

1. *What conjectures can you make about the position of the points and the variations?*

After the class has had an opportunity to make conjectures, send a **QUICKPOLL** to capture one conjecture per student. Lead a discussion pertaining to the validity of these conjectures. In particular, ask students if they can find counterexamples or if they support the conjectures.

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**Section 5 (20 minutes)**

Finally, the class will answer the remaining two questions. The teacher will guide the students in a discussion of the answers to these questions.

*Page 1.8 shows numerical calculations for the sum of the variations from the boxplots on page 1.6. Then, these values are used to calculate R-squared (option 4). Explore how the values change when you change the data points in the scatterplot. Using your exploration and the information provided on page 1.8, create a definition for* ***r-squared****, and explain how it is used to gauge the effectiveness of the LSRL.*

1. *Definition for* ***r-squared****:*
2. *How does R-squared measure the effectiveness of the LSRL.*

**Total Time needed 60 minutes**