Lesson 5 – Post-Visit
Other Baseball Statistics

Objective: Students will be able to:

- Review that there are many different statistics and averages that show a baseball player’s success.
- Select and create appropriate graphs representing data sets.
- Compare statistics from different eras and identify similarities and differences between them.

Time Required: 1-2 class periods

Materials Needed:
- Calculators
- Scrap Paper
- Graph paper
- Pencils

Vocabulary:
Earned Run Average (ERA) – A measure of a pitcher’s effectiveness; calculated as the average number of earned runs allowed by the pitcher for every nine innings pitched

Statistics - A branch of mathematics dealing with the collection, analysis, interpretation, and presentation of numerical data
Statistics: Batter Up! - Level 2

**Applicable Common Core State Standards:**

**CCSS.Math.Content.6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

**CCSS.Math.Content.6.RP.A.2** Understand the concept of a unit rate \( \frac{a}{b} \) associated with a ratio \( a:b \) with \( b \neq 0 \), and use rate language in the context of a ratio relationship.

**CCSS.Math.Content.6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

**CCSS.Math.Content.6.NS.B.2** Fluently divide multi-digit numbers using the standard algorithm.

**CCSS.Math.Content.6.EE.A.2** Write, read, and evaluate expressions in which letters stand for numbers.

- **CCSS.Math.Content.6.EE.A.2a** Write expressions that record operations with numbers and with letters standing for numbers.

**CCSS.Math.Content.6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

**CCSS.Math.Content.6.SP.A.1** Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.

**CCSS.Math.Content.6.SP.B.5** Summarize numerical data sets in relation to their context, such as by:

- **CCSS.Math.Content.6.SP.B.5a** Reporting the number of observations.
- **CCSS.Math.Content.6.SP.B.5b** Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

**CCSS.Math.Content.7.RP.A.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
Applicable Common Core State Standards (Continued):

**CCSS.Math.Content.7.EE.B.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

**CCSS.Math.Content.7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

**CCSS.Math.Content.8.EE.C.7** Solve linear equations in one variable.
1. To begin this lesson, review the formulas for determining batting average and slugging percentage. *Note* If your students did not cover slugging percentage as part of their learning experience with the Baseball Hall of Fame and Museum, simply review batting average.

2. Ask students to brainstorm ways that statistics might relate to other baseball skills. Ask, “What are some activities that baseball players are expected to perform on the field at which they might not be successful every time.” Possible answers include: pitching a winning game, pitching many strikes, successfully stealing a base, etc.

3. Discuss that there could be (and there are) many different types of statistics for all sorts of activities that take place on the field. Students will now take a closer look at batting and pitching statistics from different eras.

4. Introduce the activity.
1. Assign each student 2 weeks of game logs: one for a pitcher and one for a batter from the 1950s era, and one for a pitcher and one for a batter from the current year. Students will ultimately have 2 weeks of logs for 4 players. Game logs are available at http://baseball-reference.com.

2. Each game log should have Games, At Bats, Runs, Hits, 2B, 3B, HR, RBI, Put Outs, Assists, Errors for a batter. For a pitcher the log should have Games, Innings, Wins, Losses, Hits, Runs, Earned Runs, Strike Outs, and Walks.

3. Have students calculate the total for each category for each of their players.

4. Once students have finished, ask students questions to encourage them to interpret their players’ data. For example, “Based on your data, can you determine which skills your players were particularly good at?” “How did you reach that conclusion?”

5. As a class, create four master lists as follows:
   - 1950s Batters
   - 1950s Pitchers
   - Modern Pitchers
   - Modern Batters

6. Have all students report their data for each category. Calculate totals for each.

7. Look at the data compiled on the class master lists. Determine averages for each category.

8. Discuss what graphical representation would be the best fit for each data set. Have students make the selected graphs.
A Note about ERA:
Measuring a pitcher's earned run average, or ERA, is a way of determining how effective the pitcher is without taking other players' errors into account. ERA represents how many runs a pitcher gives up during an entire game pitched, so the lower the number the better. ERA standards have varied throughout the years. Today, ERAs in the low 2.00s are considered excellent, with the average typically running over 4.00. (www.livestrong.com)

For this exercise, students don’t need to calculate ERAs. That information should already be on each pitcher’s game log. To determine the ERA of the aggregate data, students can simply average the ERAs already calculated.

Conclusion:
To complete this lesson and check for understanding, have students compare the data from the 1950s with the data from the current year. Discuss the similarities and differences between the statistics of each era. What might account for the changes in statistics from the different eras?

For homework, have students write journal entries in which they address the importance of statistics. Do statistics tell a manager or an owner everything he or she needs to know about a player? What are some skills that can’t be revealed through statistics?