Mathematics: The Language of STEM
Who's on your Team?
Stacy Huffer

CONTENT AND TASK DECISIONS

Grade Level(s): 5th Grade

Description of the Task: Students will organize soccer players' data into a line graph, bar graph, line plot and/or data table. They will use the information to determine which 11 players on their team they will choose to be the starters. They will justify their thinking by using the players' statistics and the organized data. This lesson focuses on soccer but could be adapted for other sports as well.

Indiana Mathematics Content Standards: 5.DS.1 Formulate questions that can be addressed with data and make predictions about the data. Use observations, surveys, and experiments to collect, represent, and interpret the data using tables (including frequency tables), line plots, bar graphs, and line graphs. Recognize the differences in representing categorical and numerical data.

Indiana Mathematics Process Standards: PS.5: Use appropriate tools strategically. Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Mathematically proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. Mathematically proficient students identify relevant external mathematical resources, such as digital content, and use them to pose or solve problems. They use technological tools to explore and deepen their understanding of concepts and to support the development of learning mathematics. They use technology to contribute to concept development, simulation, representation, reasoning, communication and problem solving. ****Students will use tools to help them find a solution to the problem.**

Mathematics Content Goals: Students will use real-world data to help them create a winning team.

Language Objectives: Students will be able to explain their reasoning and prove their answers in writing using clear, mathematical vocabulary. They will also present the information verbally to another pair of students.

Materials: players' stats (resource sites listed below-samples are also attached), pencil, colored pencils, paper, graph paper, rulers (for straight lines), Microsoft Excel (if student computers are available)
Players'Statistics:
www.whoscored.com/Statistics www.foxsports.com (men's soccer)
www.nwslsoccer.com (women's soccer)
www.nfl.com/stats/player (football)
worldcup.2015.women.fivb.com (women's volleyball)
www.wnba.com (women's basketball)
stats.nba.com (men's basketball)

THE LESSON

Before: Many students in fifth grade understand what data is and some purposes for its use. However, it would be beneficial to spend a few minutes refreshing their memory. You may want to record their thinking on a chart for them to reference to later.

- **Activate prior knowledge**
  - **What do you know about data? Why is it important?**
  - **What are some examples of using it?**
  - **Are there different ways to display the information? (Discuss the different types of graphs and data tables.)**
  - **Why are different types of data displayed in different ways?**
  - **How do you think coaches and recruiters use data in determining their players' roles?**
- **Student Actions:**
  - Students will participate in the discussion about data and its purposes. They will respond the questions above and discuss the different ways data is represented.

- **Teacher Actions:**
  - Teacher displays the problem. "Today you are going to work with at least one other person to create your dream starting list for your soccer team. Together you will organize the player statistics you are given into a graph or table. You may choose what is the best method for your purpose. You will need to select your top 11 players to start. Along with choosing your players, you must be able to justify why you selected each one and predict how you think your team will perform. You will be given a specific list of 30 players from which to choose your 11 players. You may manipulate the information in any way that seems beneficial to you and your partner. For example, you may cut apart the list to be able to organize the data pieces. You will also be given graph paper and have use of the computer if needed. Once your teams are selected, you will present your players' list to the class and justify your choices using the data information."

During:
- **Student Actions:**
  - Students will work with a partner and examine the data given to them. They may choose between a men's soccer team or a women's soccer team.
  - Students will organize the data into a clear, understandable graph or table. Students will use paper, colored pencils or Microsoft Excel. From this information, they will select their top 11 players.
  - Students will write a brief explanation about why they chose the players they did.
- **Teacher Actions:**
  - Teacher will provide the graph paper, rulers, statistics, colored pencils and computer resources. He or she will monitor student understanding as they work by observing and asking questions.
  - Let go, listen actively, and provide appropriate support:
    - Some possible questions:
      - What information do you have?
      - How are you planning to organize your data?
      - Why did you choose this type of graph/table?
      - What criteria do you think is the most important?

- **Possible Extensions**:
  - Students may look at the statistics of the top five teams in the league and compare their individual player statistics.

After:
- **Student Actions:**
  - Students will present their information to another set of partners. They will be expected to explain why they chose to display the information as they did. They will explain and justify why they chose the 11 players they did rather than any of the other players. They will refer to the statistics to help justify their selections.
- **Teacher Actions:**
  - Teacher will facilitate the discussion by asking questions that promote student thinking and understanding.
  - Once partners have shared, the teacher may want to select a group or two to share with the whole class. The teacher could have two groups present and have the class predict which starting team will win and why.

ASSESSMENT

Observe:
- Are students using appropriate math vocabulary?
- Are students able to understand the information in order to organize it?
- As students are creating accurate graphs or tables?
- Are the students able to support their thinking with evidence from the information?

Ask:
- Why did you choose to display the information in the way you did?
- How was this type of graph more useful/helpful than choosing …………………?
- How did you start the process of choosing your top 11 players?
- Team graphs will be collected so the teacher can see each graph and read the students' explanation.

Men's Soccer Player Statistics

www.foxsports.com

Player Name	Goals	Assists	Yellow Cards	Red Cards	Shots
Adam Lallana	8	7	3	0	43
Andre Gray	9	3	2	0	46
Christian Benteke	8	15	10	0	106
Christian Eriksen	8	15	0	0	133
Dele Alli	18	7	4	0	94
Fernando Llorente	15	1	2	0	48
Gary Cahill	6	0	5	0	24
Harry Kane	29	7	3	0	110
Heung-Min Son	14	6	2	0	80
James Milner	7	3	5	0	35
Jamie Vardy	13	5	2	1	54
Joshua King	16	2	1	0	67
Leroy Fer	6	2	9	0	36
Manuel Lanzini	8	2	9	0	69
Mesut Ozil	8	10	2	0	40
Olivier Giroud	12	3	2	0	39
Philippe Coutinho	13	7	2	0	106
Romelu Lukaku	25	6	3	0	111
Sam Vokes	10	3	0	0	57
Troy Deeney	10	4	7	0	43