

Identifying the mystery player

Comparing body measurement data of the Irish soccer and rugby teams

Comparing data helps pupils in the senior classes understand why we calculate statistics (means, medians, modes and ranges). These statistics are useful summaries of a set of data, in particular the middle of a data set, which can then be used to describe and compare data. In this article we report on a data investigation, involving comparing data sets, which we carried out in two

schools in Limerick city. The investigation follows the structure of the PPDAC cycle (see *InTouch*, March 2012) as a framework which supports children in becoming 'Data Detectives'. The focus of this investigation is to explore similarities and differences between the heights and weights of the (male) Irish soccer team and rugby teams.

Step 1 (PPDAC): Problem

When designing statistical investigations, generate interest by setting a context and posing a problem which motivates pupils to analyse and compare data.

Setting the context

Show two short video clips (accessed from youtube) of the Irish soccer and rugby teams playing in recent matches. Prior to playing the video, prompt children to watch out for similarities and differences between the players.

Posing the problem

The teacher introduces the **mystery player problem**.

"A player from the Irish team was running in the gym, fell off the treadmill and got concussed. He can't remember what sport he plays. He is either an international player of rugby or soccer. At the end of the lesson we want you to use the information you've gained (his height and weight) to identify what team he belongs to and why you might think this."

Question the children about similarities and differences between the soccer players and rugby players:

- ✎ In which team of players would you find the heaviest player?
- ✎ Why?
- ✎ In which team would you find the tallest player?
- ✎ What units do we use to measure height/weight?

Step 2 (PPDAC): Plan

Distribute cards (similar to top trump cards) with information about individual rugby players and soccer players (see image 1). We sourced this information from the internet and made the cards. Tell children that they are going to graph the data using a line plot (see *InTouch*, May 2012). If necessary, review the process of constructing a line plot.

Left – Image 1: Example of a player card

Step 3 (PPDAC): Data

Arrange the children into groups; each group has responsibility for collecting and graphing

a particular type of data for a particular group of players. We had four groups:

- Group 1: Focus on weight of rugby players.
- Group 2: Focus on height of rugby players.
- Group 3: Focus on weight of soccer players.
- Group 4: Focus on height of soccer players.

Each group should have the necessary player cards for this assigned task. Provide each group with large poster paper on which to make their line plot (it may be useful to outline a grid on the paper so that plotted data are the same size). We recommend that each child in the group has the opportunity to plot some of the players onto the line plot. Other group members can help find the information off the appropriate card and check the accuracy of the data recorded (see image 2). Circulate around the room providing support to groups where necessary.

When the graph is completed each group spends a few minutes discussing their graph and preparing a brief presentation to make to the class outlining three features of the graph. There are opportunities to make links with the measurement strand of the primary curriculum by posing questions to groups such as: how much taller is the tallest rugby player than you? Name another item that you think weighs the same as the heaviest rugby player?



Left – Image 2: Plotting the height of the Irish rugby team

Step 4 (PPDAC): Analysis

Analysing the graphs

Each group presents their graphs and findings to the class (see image 3). Children worked with reported on minimum and maximum values, the range of their data, the most frequently occurring values (modes) and interesting features specific to their data. The graphs are then arranged on the wall/board for the class to see. The graphs for the height of soccer and rugby players are placed above/below each other. Adjacent to these height graphs, the graphs for the weight of soccer and rugby players are placed above/below each other.



Image 3: Reporting on the heights of the Irish soccer team

A guided analysis: Who is the player?

Pose a series of questions to support the analysis and comparison of heights/weights for rugby and soccer players. Structure questions to increase in complexity – this is facilitating pupils to begin the process of reading the data, between the data and beyond the data (see *InTouch*, March 2012). Here are some suggestions for questions:

Reading the data

- ✎ What is the heaviest/lightest weight (minimum/maximum values) on the rugby team?
- ✎ What is the heaviest/lightest weight (minimum/maximum values) on the soccer team?
- ✎ What is the tallest/shortest height (minimum/maximum values) in the soccer team?
- ✎ What is the tallest/shortest height (minimum/maximum values) in the rugby team?
- ✎ Can you tell us anything about the shape of the data?
- ✎ Are there clusters of data?
- ✎ Are there any outliers (unusual data value separated from the cluster)? Gaps (holes)?
- ✎ Are there any crossover points i.e. common data values?

Reading between the data

- ✎ What is the difference between the heaviest and lightest player on the rugby/soccer team?
- ✎ What is the difference between the tallest and shortest on the rugby/soccer team?
- ✎ What is the range in height (or weight) for the rugby team?
- ✎ Is the range in heights (or weight) greater in the rugby team or soccer team



© Shutterstock: Mitch Gunn

Reading beyond the data

Then pose the question:

- ✎ Is there a difference in height between soccer and rugby players?
- ✎ How do you know?

Encourage children to use the data presented on the graphs to support their answers. Give the children a minute to discuss in groups. Repeat this process for the question: Is there a difference in weight between soccer and rugby players? How do you know?

Calculating the measures of central tendency

Start by revising the concepts of central tendency: mode (most frequently occurring data value), median (exact middle value; see *InTouch*, May 2012) and mean (the fair share; see *InTouch*, April 2012). Ensure that children understand the meaning of these measures prior to eliciting the procedure for calculating the measures. We find that children might be able to calculate the mean, median and mode but may not possess functional understanding of the measures i.e. when it is useful to calculate the measure. You may use questions such as this:

- ✎ What is the mean/median?
- ✎ What does it tell us about the data?
- ✎ Why would we calculate it?

In groups, children find the mean, median and mode of the data they placed on their graph. Encourage children to estimate the value first and then calculate it. Use calculators to identify the mean. Place these values on labels and tape them onto the appropriate graphs. On each graph it will now be clear, the location of the mean, median and mode of the data (see image 4).

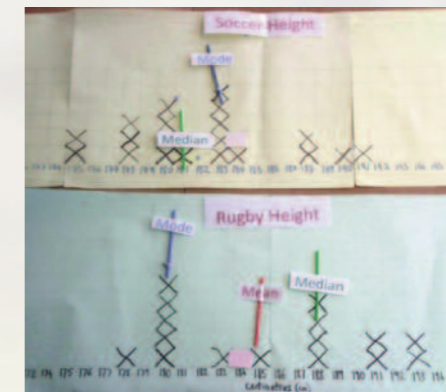


Image 4: Locating the mean, median and mode on a graph

The discussion should now focus on what the mean, median and mode tell us about the distributions (i.e. the heights and weights of soccer and rugby players). Pose a series of questions to guide children in reasoning about these measures e.g.

- ✎ Can anyone spot any differences or similarities between the means, medians and modes of the soccer and rugby teams?
- ✎ Were any players (either rugby or soccer) the actual mean/median value?
- ✎ Why is the mean not in the middle of the graph?
- ✎ Why might the mean and median be different?
- ✎ Look at the median of the rugby height – what is the difference between this and the soccer height

median? What does the median tell us (i.e. half the players are below/above this value)? We found that children are able to posit reasons to account for differences in the data. Some comments we heard; "the mean, median and mode are higher for the weights of rugby players. This is because rugby players are generally bigger than soccer players" and "rugby has more contact so they need more weight for more power". Children need to support any hypotheses/assertions by making reference to the data. Encourage this type of data-driven reasoning by continually asking children to justify their answers: "Why do you say this? What data (on your graph) support you? Show us what you mean by pointing to the graph."

Step 5 (PPDAC): Conclusion – Presenting the player

The teacher presents an outline of the mystery player. State that the player weighs 86 kilograms and use a sticky note to locate his stats for weight (86kg) on both soccer and rugby graphs. Question the children:

Based on what the graphs tells us about the general weight for a rugby/soccer player, could the mystery player belong to either of these teams? Which team is he most likely to belong to?

Then state that the player is 184cm tall. Again, place a sticky note on both graphs to locate the height of the mystery player. Question the children:

- ✎ Could he belong to either of the teams?
 - ✎ Are his height/weight typical values for a rugby player? Soccer player?
 - ✎ Which team do you think he belongs to? Why?
- Ask children, in their groups, to come to a conclusion on the identity of the mystery player. You may wish to get the class to vote on whether he is a soccer/rugby player.

To conclude the lesson we revealed the face of the mystery player to be: Ronan O'Gara. Remind children that he belongs to the rugby team. Ask: Could he have belonged to the soccer team? Why?

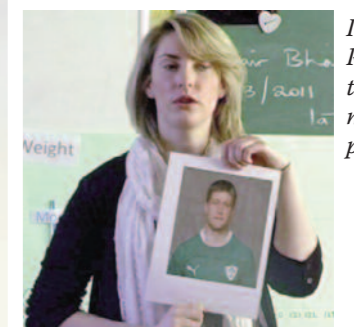


Image 5: Revealing the mystery player

AISLING LEAVY and MAIRÉAD HOURIGAN lecture in Mathematics Education in Mary Immaculate College.

Acknowledgements: Sincere thanks to the co-operating pupils and staff in Scoil Mhathair Dé (Limerick City) and St Michael's NS (Limerick City). Thanks also to Aine McMahon, Olivia Buckley, Tomas Horgan, Orla McMahon, Niamh Murray and Aisling O'Sullivan for their contribution to Lesson Study.

Note: Previous issues of *InTouch* are available online in the Publications Section of www.into.ie