Why Does It Always Rain on Me?

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CONNECTED
SCIENCE • TECHNOLOGY • MATHEMATICS
2012 LEVEL 3

Overview

This article describes how the amount of rain that falls throughout the year(s) can be explored to find patterns. Different types of displays are used to show the data and to prompt questions, and some basic features of time-series data are introduced.

Curriculum context

MATHEMATICS AND STATISTICS

GEOMETRY AND MEASUREMENT

Measurement

Achievement objective(s)

L3: Students will use linear scales and whole numbers of metric units for length, area, volume and capacity, ... temperature, and time.

STATISTICS

Statistical investigation

Achievement objective(s)

L3: Students will conduct investigations using the statistical enquiry cycle:

- gathering, sorting, and displaying multivariate category and whole-number data and simple time-series data to answer questions
- identifying patterns and trends in context, within and between data sets
- communicating findings, using data displays.

Key ideas

- Data can be collected over regular intervals of time (called time-series data).
- The data collected will vary from time period to time period.
- To establish patterns (or trends) in time-series data, we need to investigate what "typically" happens over a long period of time.
- Data may need to be grouped so that patterns can be seen more clearly.

ENGLISH

READING

Ideas

Achievement objective(s)

L3: Students will show a developing understanding of ideas within, across, and beyond texts.

Indicators

- Uses their personal experience and world and literacy knowledge confidently to make meaning from texts.
- Makes meaning of increasingly complex texts by identifying main and subsidiary ideas in them.
- Starts to make connections by thinking about underlying ideas in and between texts.
- Makes and supports inferences from texts with increasing independence.

The Literacy Learning Progressions

The literacy knowledge, skills, and attitudes that students need to draw on by the end of year 6 are described in *The Literacy Learning Progressions*.

Meeting the literacy challenges

The following strategies will support students as they engage with the information and ideas in the text. Once they understand what the article is about ("the story"), they will be able to explore the key science ideas outlined in the following pages.

The *Connected* series includes a range of texts that provide opportunities for students to locate, evaluate, integrate, and synthesise information and ideas.

It is expected that students will read across the range of texts in this *Connected* to develop their literacy skills and their understanding of the topic.

Text characteristics

- A mixed text type that combines factual details and exploratory questions with tables of data that are the subject of much of the text
- An informal, conversational voice that includes questions to the reader and rhetorical questions.

1. FINDING THE INFORMATION IN THE TEXT

This text "talks" the reader through a process of analysis to explain how collecting and reading data over periods of time makes it possible to recognise patterns in the weather.

Have the students read page 21. **ASK QUESTIONS** to elicit the idea that the writer has structured this article to be like a conversation.

Why do you think the title is in the form of a question?

Who is the "me" in the title – the writer or the reader?

What else does the writer do to give the impression that she is drawing the reader into a conversation?

IDENTIFY the informal title and opening sentence, the use of pronouns, and the rhetorical question at the end of the page with its brief answer.

ASK QUESTIONS to clarify the purpose of the title.

When you read the title, what did you predict the article would be about?

Does the title tell you what this article is about?

What other purposes does the title have?

After reading the whole article, have the students **SUMMARISE** the content in the table and graphs.

These graphs indicate the amounts of rainfall in Wellington over one week, eight weeks (in a table), one year, and four years.

ASK QUESTIONS that lead students to recognise the important information in the article.

How does our summary help us to identify the important information?

What's the most important point the writer is making? Is it about how much rain fell on Wellington, or is it about the need to collect data over time in order to find patterns? How do you know?

2. READING TABLES AND GRAPHS OF DATA

This text requires readers to repeatedly shift their focus from the paragraphed text to the data table and graphs.

EXPLAIN that headings in tables or graphs indicate crucial information.

DISCUSS a sequence for reading the information in a graph:

- the heading
- the key
- the labels on the axes
- the data within the graph.

ASK QUESTIONS to remind students of the vocabulary of graphs. **PROMPT** them to refer specifically to the x-axis (horizontal) or y-axis (vertical).

What do we call the column on the left-hand side of the table?

What differences do you notice between the table and the graph on page 22? (In the table, the labels are on the top of the information; in the graph, they're on the bottom. The rainfall information is given numerically in the table and visually in the graph.)

Exploring the mathematics

The following activities and suggestions are designed to support students to develop statistical understanding as they explore weather data.

Key ideas

- Data can be collected over regular intervals of time (called time-series data).
- The data collected will vary from time period to time period.
- To establish patterns (or trends) in time-series data, we need to investigate what "typically" happens over a long period of time.
- Data may need to be grouped so that patterns can be seen more clearly.

MATHEMATICAL IDEAS AND LANGUAGE

- Vocabulary (measurement data, time series, variation, seasonal variation, trend)

FOCUS QUESTIONS

- How do you measure and record weather data?
- How do you know if there is a pattern in the data?

Activity 1: *Collecting weather data*

Discuss with the students how the amount of rainfall might be recorded. Refer them to the graph and ask them what units of measurement were used for rainfall (mm). Ask them to show how much 26 mm is. They will show you 26 mm as a length, so challenge them to think about how this would work when measuring a liquid like water. Ask them what units are normally used to measure liquid (that is, mL).

Explain that rainfall is actually measured in a cylinder (a rain gauge – the standard size has a diameter of 2 cm). Make the link that although rain is collected as a volume, it is measured by how high it is in the rain gauge, that is, 26 mm is the measure on the side of the cylinder. Students could then practise filling measuring cylinders with different amounts of water and reading off the scales in millimetres.

To investigate whether the same width cylinder always needs to be used to measure rainfall, ask students to bring in their own plastic bottles from home. These can be made into rain gauges by keeping the lid screwed on, cutting the bottoms off, turning them upside down, filling them with enough water to get past the funnel-shaped section, and then marking with a permanent marker the current line of the water.

Students can then place the different-sized bottles outside overnight and measure how much above the line the water level is (given that it rained overnight!), using millimetres as the units. The students should find that even though they have used different-sized bottles, the amount of rainfall measured by each student is very similar (the differences are due to measurement errors).

Challenge your students to consider why this happened. Explain that the wider the rain gauge, the greater area it has, so it can catch more rain. Investigate this further by pouring the same amount of water into different-sized cylinders and asking the students to measure the distance along the side of the cylinder from the bottom to the line of the water. (Don't use measurement cylinders because the existing scales may confuse students.) They should discover that wider cylinders will not fill up as fast as narrower cylinders. So, even though they catch more rain, they take longer to fill up, and this is why the different-sized rain gauges will give the same rainfall measurement.

Then encourage your students to collect daily data for a weather measurement over an extended period of time (this could be rainfall or another measurement like temperature). They could record the data themselves by using appropriate measurement equipment or use the data on the MetService website. Students will need to collect their data at a consistent time of day and keep a log book to record the day, date, time, and measurement (using appropriate units).

Activity 2: *Investigating weather data*

Using data for a number of months that the students have collected or you have obtained from the MetService website, discuss how to represent the data in a display. The following activity refers to rainfall, but this can be adapted for other weather data by choosing an appropriate graph, for example, a line graph for temperature.

Demonstrate how to draw a bar graph to show the amount of rainfall for each day over one week. Make links between the height of the bar (which represents the amount of rainfall in mL) and how rainfall is measured (by measuring how much a rain gauge has been filled up with water). (Similar links could be drawn between temperature on a thermometer and a point on a line graph.)

Students can then work in pairs to produce a bar graph for the amount of rainfall for one week. (Give each pair of students a different week to explore.) To help with interpretations of the data later, make blank graphs with the same axes for the students. (If possible, print the blank graphs onto overhead transparencies and have students draw the graphs with permanent markers. This will allow them to lay their graphs over one another so they can compare patterns.)

Ask students to look at their graph (and their data) for the week and identify which day had the most rain. Each pair of students should share this information with the rest of the class so that students realise that the day with the most rain varies from week to week. To see this visually, arrange the graphs vertically on the whiteboard in order of time so that each graph is parallel to the one above it. The students should be able to see that the highest bar does not always happen on the same day of the week.

You can then arrange the students' graphs horizontally in chronological order to investigate the pattern for rainfall over time. Encourage them to look at the data over the different weeks and discuss any patterns or features, for example: *How many days was there no rain at all? Which week had the day with the highest rainfall?*

Suggest to the students that they add up their data to show how much rain fell in total across the week. You could draw an axis below the sequence of graphs on the whiteboard. Each pair of students could add up the total amount of rain that fell for their week and add this measurement to the class graph. When the graph is completed, ask students to describe any patterns or features, for example: *Does the total amount of rainfall appear to be increasing, decreasing, or staying the same over the weeks? Was there an unusual week (lots of rainfall or none)?*

Refer the students back to the graph of the monthly rainfall for Wellington across 2010 (page 22) and ask them how this data would have been collected (by recording daily rainfall and then adding up across the month to get a monthly total). Extend this idea of regrouping data to the final graph, Wellington Rainfall 2007–2010, where the data has been grouped by season.

MINISTRY OF EDUCATION RESOURCES

Figure It Out:

- *Statistics: Revised Edition*, Level 3 (2008): Well Weathered, pages 10–11
- *Statistics: Revised Edition*, Levels 3–4 (2008): School Crossing, pages 2–3; Bean There, pages 16–17
- *Statistics: Revised Edition,* Levels 2–3 (2008): Discussing Data, pages 14–15

FURTHER RESOURCES

- MetService website: www.metservice.com
- NIWA climate statistics: www.niwa.co.nz/education-and-training/schools/resources/climate

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