20 *teaching ideas linked to investigations*

1. **The two Qs!** Qualitative: expressing something with words. Quantitative: expressing something with numbers. Give students a scenario and ask them to describe it qualitatively and quantitatively e.g. letting a dog loose in a room with treats scattered all over the floor, volume of sound during a snooker match at the Crucible.

2. **The two Qs – take 2.** Give statements such as 'the greater the number of cars the harder it is to cross the road', 'Brian Cox is my mum's favourite scientist'. Can the statement be described qualitatively, quantitatively or both ways? What's the difference between the two?

3. **Apparatus and accuracy.** Show a range of apparatus used to measure length and/or volume. Suggest things to be measured e.g. arm span, comparison between length of index and ring fingers, length of finger nail, thickness of nail. Which apparatus would they choose and why?

4. **Variables.** Give some 'everyday' measurable situations and consequences e.g. amount of revision – final exam grade; packets of crisps eaten – level of thirst; frequency of face-pulling – crossness of younger brother. Students decide which would be the independent and which the dependent variable.

5. **In my opinion.** Students write down their opinions on a range of subjects such as advertising on children's TV, age at which you can drive, school day beginning at 10am, the best DVD. Then decide to what degree these opinions have been based on scientific evidence.

6. **Rounding warm-up.** Show 20 numbers scattered across the white board (e.g. 11.2, 11.5, 11.6, 12.0, 12.1, 12.2, 12.7 etc.). How quickly can students pick out all the numbers which can be rounded to a particular number (e.g. 12)?

7. **Inevitable error.** Students use a home-made ruler marked in cm to measure five lines to the nearest cm; all the lines are of different lengths but will give a measurement of 6 cm. Use a conventional ruler to measure lines to one d.p. Explain that their measurements will fall within a range around the true value.

8. **More error.** Using the example above can students identify other sources of error? Accuracy of home-made rulers; misunderstanding how to round to nearest cm; judgement of individual using the ruler etc.

9. **Range of data**. Give pairs of students a set of results (this can be easily differentiated). Start the timer. Who can work out the range of their data quickest?

10. **Mean machine**. Students calculate the mean of the data given above. Point out that the mean should be given to the same number of d.p. as the data they began with (it cannot be more accurate than the raw data).

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11 **Which graph?** Display an example of a bar chart, frequency chart, frequency histogram and line graph. Show questions which have been investigated and/or tables of results. Students decide which type of chart or graph is an appropriate method of display and explain why.

12 **Reading a graph.** Show several simple line graphs. Give students some fun scenarios to match to the graphs. E.g. level of excitement about Christmas – age of individuals; speed of bicycle as you approach and cycle over hump-backed bridge. Students can make up their own examples.

13 **Human graph.** One (tall) student and post-its represent the y-axis. Post-its on floor = x-axis. Individuals stand in graph holding post-it to mark the plotted point. When all in position they can hold a length of string to represent a line graph.

14 **Graph in the grounds.** If there is a suitable perimeter fence students use it to make axes using string and plot points with bows of coloured cord.

15 **Catwalk graphs.** Give students images of different graphs. Students imagine graphs are models on a catwalk. Write a commentary describing what the graph is 'wearing' tonight.

16 **Gallery graphs.** Give students images of graphs. Students imagine them as artworks exhibited in a gallery. They write a commentary to explain the exhibit to the viewer.

17 **Strictly come graphing.** Show a variety of line graphs. The independent variable (**Iv**y) is partnered with the dependent variable (**D**a**v**y). How would Bruno describe their performance?

18 **Bias.** Give students 5-10 statements about some imaginary investigations. Students order statements in terms of degree of potential bias. E.g. research into effect of fruit juice on milk teeth funded by a juice producing company. Discuss how and where bias might occur in investigations.

19 **Consequences.** Students randomly select a word from 'ethical', 'social', 'economic' and 'environmental'. Present a scenario to them in the form of a newspaper headline, e.g. 'New drug prevents ageing!', 'Sea temperatures rise by 1°'. Students decide a consequence linked to their chosen word.

20 **There are limits!** What are the questions that science cannot answer? Produce a list. Can science make any contribution to any of these questions?