

Argument in Science

Investigating correlational data

Aims

The aim of this exercise is to explore the links between data sets. Essentially what you are seeking to show is that because two sets of data appear to be related, it does not mean that they are linked until you can think of a theory to link the two.

Intended learning objectives

- To show that measurements of quantities can be shown to be linked.
- That our confidence in the link is weak until we have some explanation, 'theory' or idea relating the two.

Activity

Name	Age	Sex	Distance (m)
Bob	11	Boy	79
Carolyn	11	Girl	63
Cathy	12	Girl	68
Colin	12	Boy	90
Helen	13	Girl	61
Janice	11	Girl	68
Jeff	12	Boy	88
Judy	13	Girl	82
Karen	9	Girl	71
Lincoln	10	Boy	69
Mel	10	Boy	65
Mike	13	Boy	95
Sarah	12	Girl	70
Sue	10	Girl	77
Charlie	11	Boy	73
Anita	14	Girl	74
Ismir	14	Boy	82
Shona	14	Girl	91

The data here show the information collected on how far some 10 to 14 year old pupils can swim in two minutes.

The questions that the PE teacher wanted to answer were:

- 1 Is the speed at which you can swim related to age?
- 2 Is there a difference between boys and girls
- 3 How sure can we be of the results?

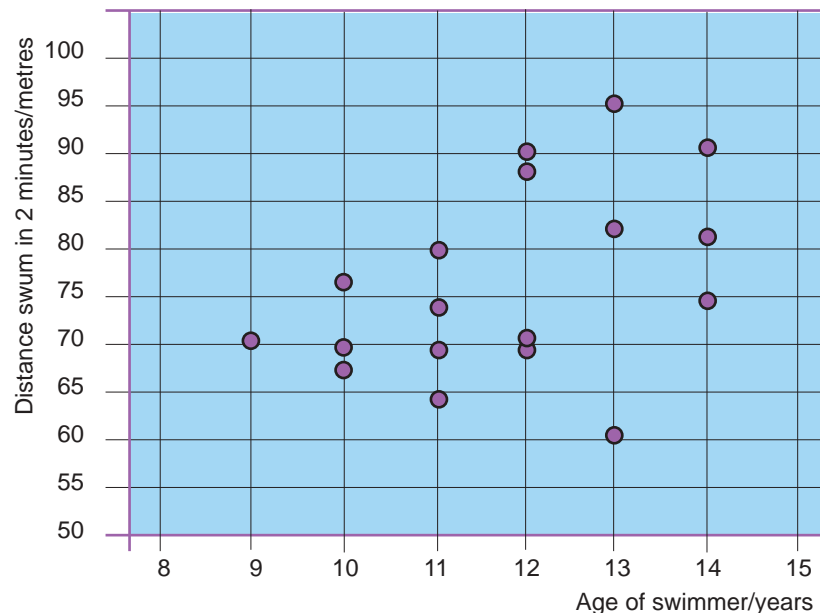
Using the data, how would you answer her question?

Teaching Points

There are a variety of ways of representing this data. It is likely that younger pupils would simply draw a bar chart of some of the data if left on their own. However, a more structured approach would be to ask them to take the following table and add data to it.

Age	Distance (m)
11	79, 63, ...
12	
13	
....	

For older pupils, it is better to ask them to plot a graph of age against distance



The data set is interesting because it does not show an *absolutely certain* relationship. There is a clear trend but not a certain relationship.

This next point is to ask for what would give more confidence in the trend?

The point to bring out here is that confidence would be improved if there was a clear idea or theory relating the two sets of data – that is that there was some knowledge which would explain the link. What knowledge would help to explain the link? (Children of this age are growing and developing larger and stronger muscles which would enable them to swim faster).

The second question can then be answered by completing a table of:

Sex	Distance
Girls	70, 77, ...
Boys	70, 82, ...

And asking them to:

- 1 Compare the maximum and minimum values.
- 2 Establish the median (middle) and the average values.
- 3 Compare the values for boys with the values for girls.

Again the point of this activity should be to show that the evidence is not conclusive. Greater confidence would be developed by an explanation which supported any trend.

Possible Extension Activities

Other data sets that are useful for this area are:

- Eye colour and hair colour.
- Feet size and height.
- Hours spent on homework per night versus hours spent watching TV.