

Improving the school environment: **Where's worst?**



Images of Strand School courtesy of Martyn Arnold

Image © Stockport Council, 2006

Objectives

Children should learn:

- To relate individual statistical techniques to a wider problem
- To draw stem-and-leaf diagrams and calculate mode and median from them
- To think analytically about a statistical problem
- To apply a variety of techniques to solve a problem

Activities

- Class, group and paired discussion
- Data collection
- Drawing stem-and-leaf diagrams, calculating median, mode and percentages
- Drawing conclusions from charts and results as well as using them as supporting evidence for a conclusion
- Writing a report for the school council

Points to note

This presentation contains 19 slides.



Improving the school environment

Pupils can spend over a 1000 hours at school each year! It is important that all this time is spent in a good working environment.

In many schools, the building, classrooms and facilities need improving. The Government has made money available but it is limited.

BBC NEWS
You are in: Education
Wednesday, 19 December, 2001, 11:52 GMT
Cash boost for 'crumbling' schools

The aim is to get school buildings in top order
Schools in need of refurbishment could be set for a facelift, as the government gives details of a capital investment package worth more than £800m.

Objectives

Children should learn:

- The context of the problem

Activities

- Discussion: Why are schools currently a priority?
What improvements could be necessary in a new school?
Which schools are likely to get funding first?



Each person has a say!

With a *limited* amount of money available schools will have to focus on improving only *one or two* parts of their environment.

How can the decision about *which area* be made in a fair way –one which lets every person have their say?



Your task will be to write a mini-report for the school council giving your recommendation and evidence to back up your argument.

Objectives

Children should learn:

- The outline of the problem
- The expected outcome of the work: a report

Activities

Discussion: What is a 'fair' decision?

Points to note

The slides are editable. 'School council' could be changed to 'head teacher', 'the school governors', 'the PTA' or another appropriate body.



Where's worst?

If money is going to be spent improving the school, on which parts would you spend it and why?

Are your reasons the same as your neighbours?

Is there a right answer?

How can you compare different parts of the school in a fair way?

For example, comparing a sports pitch with an ICT room?



Objectives

Children should learn:

- That people's opinions can vary greatly
- The importance of everyone feeling like they have a say

Activities

- Discussion: Which area of the school would you renovate?
What reasons are there to renovate an area?
What reasons would the school council appreciate?
- You could highlight the importance of everyone feeling like they are being heard by priming a pupil to keep putting their hand up and trying to contribute and you making a point of ignoring their view – asking them how they felt afterwards could add to this



Qualitative or Quantitative?

There are two ways in which we judge something.
A good example is in sports.

In some sports, you
are judged on your
time or distance.



This is a **quantitative** measurement.



In other sports, judges
hand out scores based on
their opinions.

This is a **qualitative** measurement.

Objectives

Children should learn:

- To distinguish between qualitative and quantitative measurement
- To appreciate the value in the different types of measurement

Activities

- Discussion: Can you think of some examples of each type of measurement?
When might qualitative judgement be more useful than
quantitative judgement?
What are the problems associated with qualitative measurements?

Points to note

In this resource we will go on to use a qualitative measurement to gain peoples opinions about the school.

Plan



Collect

Process

Discuss

To make a fair judgement you will need more than just your opinion!

If you are going to survey other pupils, how can you collect a lot of opinions quickly and fairly?

Some geographers use **Environmental Quality Indexing** to compare different environments. They score environments based on factors that they think are important.

These are **qualitative** measurements because they are based on individual judgements

Objectives

Children should learn:

- That people use various methods to try to quantify qualitative judgements.
- To appreciate that fair judgements depend on everyone being represented

Points to note

The use of EQI will mean that students will decide on certain factors to score an environment – 'Hostile/Welcoming' on a scale of 1 to 5 for example. Several different factors will be used and then scores will be allocated to each environment by totalling the score for each factor. This total will be the index for that environment and these numbers will be used for comparison purposes.



Making Qualitative Measurements

Geographers and social scientists often use qualitative measurements.

Consider this living space.
Suppose we want to give it a score out of 20.



This is made easier by using *factors* or **criteria** to judge it with and then adding up the total score.

What would be the possible top and bottom scores?

Cold	1	2	3	4	5	Warm
Untidy	1	2	3	4	5	Tidy
Noisy	1	2	3	4	5	Quiet
Hostile	1	2	3	4	5	Welcoming

Objectives

Children should learn:

- What factors/criteria are
- How Environmental Quality Indexing works

Activities

- Get students to score the scene before it appears on the slide.
- Discussion: Does everyone agree? What do you think about the criteria? Are they important? Appropriate?
- Discussion: What scores would suggest a negative feeling?
A positive feeling?
What criteria would convince the school council of a need?
Think about safety and suitability for purpose perhaps.

Points to note

Although the same criteria should be used for all the environments you score, the group may decide to change them to more appropriate criteria.



What data should we collect?

Which parts of the school will you consider?

What criteria will you use to judge each part of the school?

Example criteria

What range of scores will you give your criteria?

How many people will you survey?

Objectives

Children should learn:

- To plan what data they are going to collect, from whom and how.
- To work as a group (class or smaller) to resolve conflict

Points to note

Parts of the school:

- Choose around four areas to compare.
- Data collection can be done by visiting the area (best) or looking at digital photographs. The class should consider issues such as reliability of data – should everyone be standing in the same place? Time of day etc

Criteria:

- Choose around eight criteria to score an area on.
- Arrange them negative → positive
- There is an Excel spreadsheet available which will automatically update 8 collection sheets per A4 printout with your chosen characteristics

Scoring system:

- It is recommended that you use 0-4, an odd number of values works best.
- In geography, -3 to +3 is most common. There are advantages and disadvantages to this.

Sample size:

This will depend on the scale of your work. You could use www.surveyatschool.ntu.ac.uk to create a survey with digital photographs for a large number of students to complete.



Possible Criteria

Negatives

These
should get
low scores.

Boring	-	Interesting
Noisy	-	Quiet
Unattractive	-	Attractive
Monotonous	-	Varied
Dislike	-	Like
Dirty	-	Clean
Hostile	-	Welcoming
Neglected	-	Well maintained
Enclosed	-	Open
Polluted	-	Unpolluted
Crowded/Congested	-	Deserted/Empty
Inaccessible	-	Accessible
Depressing	-	Stimulating

Positives

These
should get
high scores.

Objectives

Children should learn:

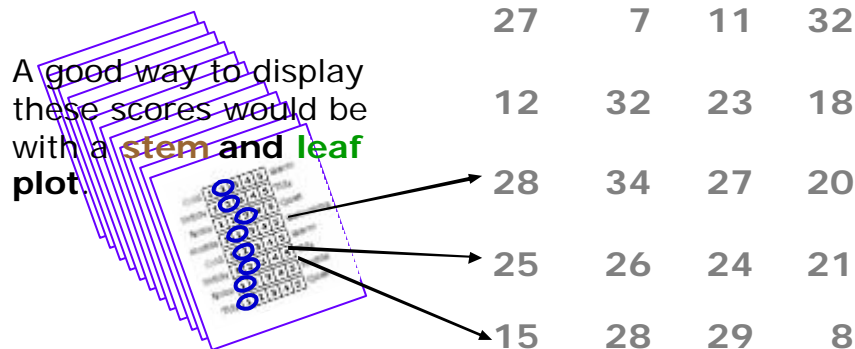
- To think about what criteria are appropriate and not appropriate for evaluating a school environment



Where's worst?

Here are some scorecards for pupils looking at their school library.

First, let's calculate total scores for each card.



Objectives

Children should learn:

- To think about appropriate ways of displaying information
- To draw stem and leaf diagrams

Activities

- **Discussion:** What methods could we use to present our information?
What are the advantages of presenting the data on a stem and leaf diagram?

Points to note

Although the slides in this presentation look at presenting the information using stem and leaf diagrams, it would be a nice activity to get students to present the data in a chart of their own choosing and then evaluate as a group how useful/appropriate it is.

Stem and leaf diagrams can be quickly drawn in Autograph by entering the data as grouped data, then choosing 'stem and leaf' on the object menu.



Where's worst?

To start we will choose the following **intervals**.
Which gives us these **stems** and these **leaves**.

	stem	leaves				
	0(0)		27	7	11	32
	0(5)	7	12	32	23	18
	1(0)	1				
	1(5)		28	34	27	20
	2(0)					
	2(5)	7	25	26	24	21
	3(0)	2				
	3(5)		15	28	29	8

Key
2 | 7 = 27

Objectives

Children should learn:

- To draw stem and leaf diagrams
- To put the leaves in order
- To include a key when drawing stem and leaf diagrams

Activities

- You could physically create your stem and leaf diagrams using large sheets of paper with the 'stems' written on, and then get your pupils to add their leaves to each of the diagrams. The leaves can then be ordered.

Points to note

The slides are editable. You may like to change the use of intervals on the stem to make this more digestible for your group and consistent with the way you usually present it.



Where's worst?

To start we will choose the following **intervals**.
Which gives us these **stems** and these **leaves**.

stem	leaves
0	
0	7 8
1	1 2
1	5 5 8
2	0 1 3 4
2	5 6 7 7 8 9
3	2 2 4
3	

Key

$$2 \mid 7 = 27$$

Now that all the leaves have been added (and put into order), we can see the **distribution** of scores.

What do you notice about the scores from this set of pupils?

Objectives

Children should learn:

- To think about the shape of the distribution

Activities

- Discussion: What was the highest score?
What was the lowest score?
What was the range of the scores?



Finding The Median

The median can be found by gradually crossing of leaves from the **top** and **bottom**.

If there are **two** numbers in the middle then find the mean of the two numbers.

Median =

stem	leaves
0	
0	7 8
1	1 2
1	5 5 8
2	0 1 3 4
2	5 6 7 7 8 9
3	2 2 4
3	

Key
2 | 7 = 27

Objectives

Children should learn:

- To calculate the median from a stem and leaf diagram by crossing off leaves

Points to note

The two methods for calculating the median from a stem and leaf diagram are presented on this slide and the following one.



Process

Or by working out the position of the median...

- Add one to the number of leaves and divide by 2.
This will tell you how many leaves to count.
- Starting at the lowest leaf, count up until you reach the 'nth' leaf.

Number of leaves = 20

$$20 + 1 = 21$$

$$21 \div 2 = 10.5$$

**Median is between
10th and 11th leaves**

stem	leaves
0	
0	7 8
1	1 2
1	5 5 8
2	0 1 3 4
2	5 6 7 7 8 9
3	2 2 4
3	

Between 23 & 24
= 23.5

Key
2 | 7 = 27

Objectives

Children should learn:

- To calculate the median from a stem and leaf diagram by calculating the position of the median first

Activities

- Discussion: Which is the modal group
What is the mode?
Is the median in the modal group?
What might this tell us?

Points to note

The two methods for calculating the median from a stem and leaf diagram are presented on this slide and the following one.

Where's worst?

Students surveyed these four places using the criteria listed on slide 9.



Objectives

Children should learn:

- To relate processed information to the context
- To structure the discussion of their results

Activities

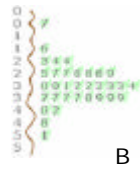
This is one of 3 slides which can be used in conjunction with worksheet 2. The worksheet models the process of discussing and interpreting the stem and leaf diagrams that another group of students have drawn, equipping the students to then complete interpretation of their own results.



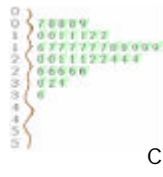
They drew stem and leaf diagrams to show the total scores for each environment.



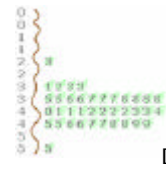
A



B



C



D

Can you match the location photograph to the Stem and leaf diagram?

What words would you use to describe them?



Objectives

Children should learn:

- To relate processed information to the context
- To structure the discussion of their results

Points to note

The worksheet encourages pupils to structure their interpretations by:

1. Commenting on what they see
2. Describing mathematically what this might mean
3. Explaining why this might be true in relation to the problem (or the picture)

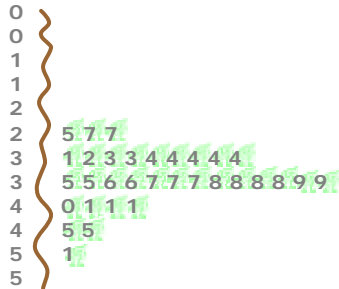
ANSWERS: A=Football ground, B=Graveyard, C=McDonalds, D=Beach



What comments can you make about your own graphs?

Try to use the structure:

1. Describe what you see
2. Say what that means mathematically
3. Give a reason why it might be



1. The leaves are not very spread out
2. The range of the scores is quite small
3. All the people had similar feelings about the environment

Key

$$3 \mid 7 = 37$$

Objectives

Children should learn:

- To relate processed information to the context
- To structure the discussion of their results

Activities

- Discussion: Highest/lowest score, modal group, median, range etc



Once you have interpreted your graphs you can report your findings to the school council.

Which are of school do you think should be the priority?

What evidence have you got to back up your opinion?

Is there anything else you would like to find out before you finalise your report?

Objectives

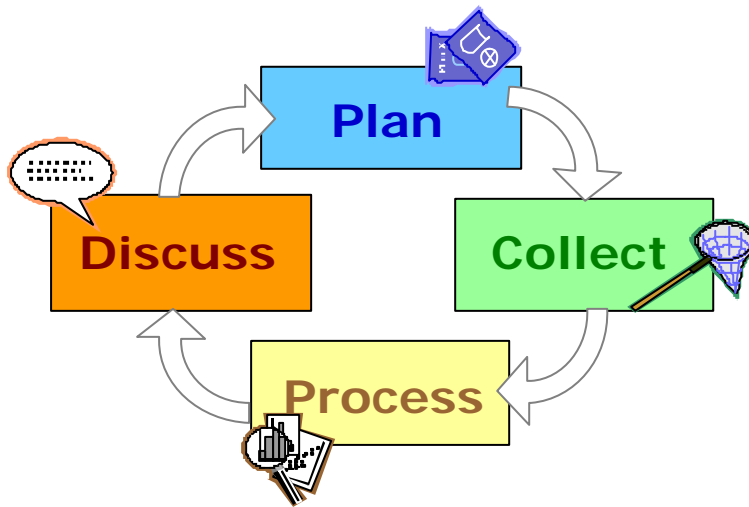
Children should learn:

- To relate all of their work back to the original problem
- To form a reasoned and well evidenced argument

Activities

You could get students to write a report for the school council or make a presentation to the rest of the group to present their results.

The Problem Solving Approach



Objectives

Children should learn:

- Where their current task fits within the whole 'problem solving approach'
- To review their prior work.

Points to note:

This screen can be used throughout the lesson at the key transition points to remind the group where they are in the cycle.