

Collecting data

Objectives

By the end of this session, teachers will:

- have considered strategies for teaching students how to plan a statistical investigation;
- have considered data types and how to collect relevant data for a statistical investigation.

Resources

For the trainer

- Computer with data projector, Microsoft PowerPoint and Presentation 11.ppt
- Whiteboard and flipchart
- Overhead projector, blank acetate sheets, and several packs of acetate pens
- *Curriculum Standards for mathematics: Grades K to 12*

For each teacher

- *Teacher's pack*
Handouts 11.1–11.2
- *Curriculum Standards for mathematics: Grades K to 12*

Session outline

What do we want data for? Slides 11.1–11.2	Whole group presentation and discussion	20 minutes
Formulating a problem and collecting data Slides 11.3–11.6 Handout 11.1	Whole group discussion Task 1: Thinking statistically Paired work	50 minutes
Conclusion Handout 11.2	Whole group discussion Final summary	10 minutes

What do we want data for?

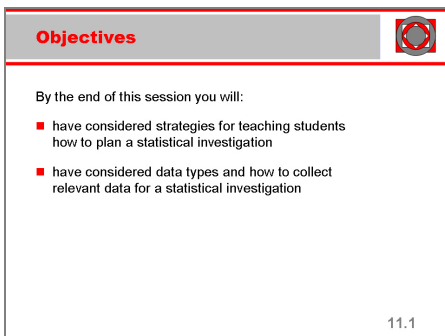
20 minutes

Welcome everyone back and make any introductions. Deal with any domestic or administrative matters.

Refer to the *Teacher's pack*. Point out the programme for the fourth day, the evaluation form for completion at the end of today's sessions and the reduced copies of the slides at the back of the pack.

Explain that this is the first of three sessions devoted to working with data. This session is about planning a statistical investigation and collecting the data, the second one will be on analysing statistical data and the third will be on representing and interpreting data.

The objectives for this first session are set out on **slide 11.1**.



Objectives

By the end of this session you will:

- have considered strategies for teaching students how to plan a statistical investigation
- have considered data types and how to collect relevant data for a statistical investigation

11.1

Before the session starts, brief any interpreter about the key points of the session.

Make sure that each teacher has a copy of the standards

Load **Presentation 11.ppt**.

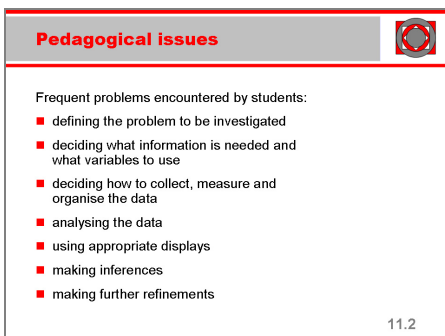
The main purpose of this session is to get teachers to think generally about the purpose of collecting data and how, once the data is decided upon, it is then collected.

Point out that the pedagogical issues concerning working with data necessarily link across the three sessions.

Ask:

- What do we need data for?
- What do you think you need to teach to enable students to work confidently with data? Does this aspect of teaching remain the same from grade to grade or do the needs change?

Compare what the teachers have to say with the issues shown in **slide 11.2**.



Pedagogical issues

Frequent problems encountered by students:

- defining the problem to be investigated
- deciding what information is needed and what variables to use
- deciding how to collect, measure and organise the data
- analysing the data
- using appropriate displays
- making inferences
- making further refinements

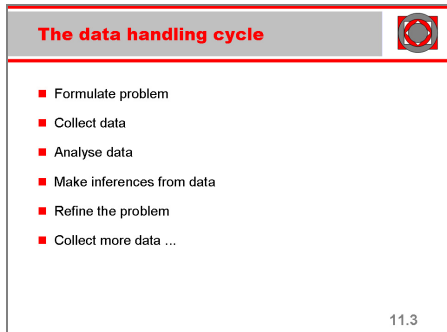
11.2

Draw out teachers' views on each bullet, asking how they would work with students, what difficulties they would expect to encounter and how they would attempt to resolve them.

Formulating a problem and collecting data

50 minutes

Elementary statistics is best taught through practical activity that incorporates the key objectives from the handling data strand of the curriculum standards. A good way to do this is to set students tasks which involve the data handling cycle as shown on **slide 11.3**.



The data handling cycle

- Formulate problem
- Collect data
- Analyse data
- Make inferences from data
- Refine the problem
- Collect more data ...

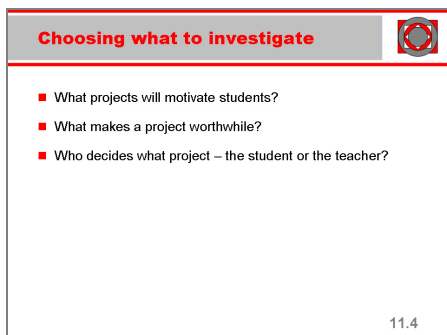
11.3

The process should be thought of as a continuous feedback loop.

Ask:

- What makes a good problem and who decides?

Show **slide 11.4**.



Choosing what to investigate

- What projects will motivate students?
- What makes a project worthwhile?
- Who decides what project – the student or the teacher?

11.4

Invite teachers' views on these issues.

Background notes for trainers

What motivates students in Grades 7–10 are probably topics in which they have a real and personal interest, such as families, health, sport, television and film, reading habits, hobbies, cell phones, clothes, nature, jobs, cars, science, music, ... In higher grades, students may have more sophisticated interests, such as politics, the environment, decision making, medicine, ...

The next phase is to think through the chosen problem and plan how to do it, as indicated on **slide 11.5**.

What data?

- Formulate the problem carefully
- Decide on the data required
- Identify the data types
- Decide the methods of data collection
- Decide how to record and organise the data

11.5

Ask teachers what different data types they can think of, and remind them that different types of data are treated differently when it comes to considering what mathematics is appropriate to use in each case.

Background notes for trainers

A quick distinction is between categorical data and quantitative data. The former describes categories or attributes; the latter takes numerical values, which can be analysed mathematically.

Once a problem has been formulated and planned, the next stage is to collect the data. Ask teachers how this can be done. Allow time for them to give their responses before showing **slide 11.6**. This shows how students can be drawn into deeper levels of thinking about collecting relevant data.

Collecting data

- Sample a population
- Carry out a survey involving the design and use of a questionnaire
- Conduct an experiment and take repeated measurements
- Simulate an experiment
- Use secondary sources

11.6

Discuss each bullet with further questions like:

- How should the sample be chosen? Why?
- How should the questions on a questionnaire be formulated to elicit the information that is sought? Will the information be unambiguous? How can the wording of a question introduce bias?
- What and how many variables do the data contain?
- What measurements will be made in an experiment? How will they be made? What units will be used for each variable? Will accuracy be important? How many measurements will be made?
- What is the purpose of a simulation? How will the simulation be carried out?
- Which is better – the use of primary or secondary data?

The important point here is not the specific answers to these questions, but rather that teachers reflect on them and appreciate their significance when they themselves are teaching.

Task 1: Thinking statistically

End the section by referring to **Handout 11.1**.

Tell teachers that this handout contains a range of simple scenarios to get them in the mood for thinking statistically. Ask teachers to work in pairs to use the remaining time for this section to discuss some of the items on the handout.

Invite comments at the end.

Conclusion

10 minutes

Refer to **Handout 11.2**. Explain that this is a writing frame to help students write up their statistical enquiry. Go through the first five sections and show how these relate to this session on collecting data. Explain that students need to do a lot of thinking and planning before they try to apply statistical techniques. Explain that the rest of the writing frame will be referred to in the next session.

Discuss the need to set aside a block of time to enable students to set up and conduct a full enquiry.

Ask teachers what factors will influence their teaching of data handling as a result of this session.

