eduqas

Pages 2 and 3

This presentation provides a basic explanation of systematic, random and stratified sampling. These are all examples of probability sampling. If conducted correctly, with sufficient consideration of sample size, frequency and timing, they should provide a representative sample.

Pages 2, 3 and 4 introduce key terminology. Students should consider whether the population they are investigating is homogeneous or heterogeneous, or to be more accurate, they should consider where the population lies on this continuous scale as this will help them to determine sample size.

Students can use online sample size calculators, but these are not required by WJEC. It is sufficient to show consideration of the nature of the population so more able students can justify whether the sample size needs to be larger or smaller. The concept of heterogeneous/homogeneous population is discussed again in the presentation on non-probability sampling, where its importance will become more apparent.

Page 4

Students need a basic understanding of the concept of a representative sample. Probability sampling strategies – such as systematic, random or stratified sampling – are designed to generate data that represents the whole population. If the researcher rejects these strategies and allows factors to subconsciously affect their decision-making, then the sample could generate data that does not represent the whole population. For example, in the page, it is clear that the whole population of this field consists of red, yellow, pink and blue flowers. There appear to be a lot of red and yellow flowers, fewer pink flowers, and the blue flowers occur in only one small area.

Imagine a researcher who does not understand sampling strategies. This researcher decides to sample the whole population by placing a single quadrat in the field – which is a very small sample size given that the population has some variety. Furthermore, the researcher is subconsciously affected by the fact that the blue flowers are slightly bigger than the others, so they place their quadrat in the position shown by the dashed square. The data they collect consists entirely of blue flowers. Clearly this does not represent the whole population. This illustrates two points:

- Variety within the population needs to be considered before sample size is chosen.
- Non-probability sampling is subject to sample bias.

Page 5

In this field, all of the flowers are red. It is a completely homogeneous population. Each time a quadrat is used, the same data is generated. A very small sample size is needed to represent the whole population. Indeed, as the population is completely homogeneous a sample of one would be sufficient. In the real world, of course, it would be very unusual for the population to be completely homogeneous.

Page 6

In this field the population is more varied – it is heterogeneous. Each time a quadrat is used, slightly different data is generated:

Quadrat 1: all yellow flowers

Quadrat 2: red and pink flowers

Quadrat 3: red and yellow flowers

Quadrat 4: red, yellow and pink flowers

It isn't until quadrat 8 that the blue flowers are sampled.

Page 7

In random sampling, the sample is selected using random numbers or another device, such as flipping a coin or rolling dice. There are several websites that will generate random numbers for free.

Page 8

Simple contexts for random sampling in sand dune and urban investigations are given here. The examples given here each relate to sampling across one or two dimensions. A sampling strategy will also be required if students want to sample temporal variations. This idea is introduced on pages 18 and 19.

More detailed examples of sampling in sand dune environments and urban environments are given in the separate presentations.

Page 9

In random sampling, every potential sampling point has an equal chance of being selected. If the sample size is sufficient, it should give a representative sample that truly reflects the whole population. In this example, a sample of 10 has been selected randomly from a population of 100.

Page 10

In this second example, another 10 sample points have been randomly selected. Each point still has an equal chance of being sampled. Notice that different points have been selected to the first sample. Random sampling points must be chosen randomly, i.e. without any subconscious decision making.

Page 11

Simple contexts for systematic sampling in sand dune and urban investigations are given here. The examples given here each relate to sampling across one or two dimensions. A sampling strategy will also be required if students want to sample temporal variations. This idea is introduced on pages 18 and 19.

More detailed examples of sampling in sand dune environments and urban environments are given in the separate presentations.

Page 12 Review

Ask students to:

1. Identify data that could be sampled in this environment. Is it biotic or abiotic?
2. Suggest a possible hypothesis or research question.
3. Suggest how systematic and random sampling could be used to select points within the dunes for data collection.
4. Identify one strength and one limitation of using these strategies.

Page 13

Stratified sampling is not really an alternative to random or systematic sampling. Rather it is a more sophisticated way of organising the sampling strategy so that sample data represents significant proportions or ratios that are apparent in the whole population. The choice of stratified sampling will depend largely on the aims of the research. In this case, is it important to reflect the proportion of embryo, yellow and mobile dunes or the age structure of the population?

If stratified sampling is selected, then:

1. It will be necessary to conduct some research before primary data can be collected so that the proportions can be estimated. This could be achieved through the use of secondary data. Alternatively, it may be necessary to conduct a pilot survey of the fieldwork location.

2. The sample points within each sub-group of the population will still need to be selected using random or systematic methods.

Page 14

So far all of the discussion has been about sample points. In fact, data can be collected:

- from sample points
- from areas
- from lines

The choice of point, area or line will depend on the data that needs to be collected. Some simple examples are shown on the page.

Page 15 Review

Ask students to:

1. Identify data that could be sampled in this environment.
2. Suggest a possible hypothesis or research question.
3. Match data to point sampling, area sampling and line sampling.
4. Justify at least one of these decisions.

Page 16

More able students will benefit from a basic understanding of frequency of sampling as this understanding will help them to:

- select and justify a suitable sampling frequency
- evaluate their sampling strategy.

Page 17

In this grid, each number between 1-100 represents potential sample points.

These points could be arranged in two dimensions (a grid on a map) or along a line (or transect). For convenience the numbers are shown in a grid, but systematic sampling is often used as a pragmatic method of selecting sample points along a line.

The limitation with systematic sampling is that not every point has an equal chance of being sampled. In this example, the sample size is 10, the same sample size as shown on pages 9 and 10. In random sampling, every potential sampling point has an equal chance of being selected. However, in systematic sampling, some sample points have zero chance of being sampled. In this example it is sample points 1-9, 11-19, etc. This makes systematic sampling less likely to be representative than random sampling if variations in the data occur at a small scale in between the sample points. For example, if the grid represents a field, then the small patch of blue plants at data points 65, 66 and 67 have zero chance of being sampled.

This page illustrates two points:

1. If systematic sampling along a line is chosen, the frequency of sample points needs to reflect the rate at which data varies along the line.
2. That random sampling is more likely to produce a representative sample than systematic sampling.

Pages 18 and 19

So far all of the slides have been about sampling in one or two dimensions over space. However, in many investigations, students also need to consider whether data is likely to vary over time. If so, sampling will need a temporal dimension.

Page 20 Review

Ask students to:

1. Suggest possible research questions or hypotheses.
2. Discuss how probability sampling could be used in this investigation to select:
   a) spatial patterns
   b) temporal patterns
3. Consider and justify the frequency of temporal sampling; i.e. how often would they sample data and why have they chosen these time intervals?