

Guidance for teachers

Statistics

Mean, median, mode and range (MMMR)

Teacher guidance

Please use the following guidance to structure session one, the first in a series of four.

Prior learning of statistical techniques, including mean, mode, median and range, and GCSE Maths would be beneficial. However, it is not essential.

Resources required:

- MMMR worksheet
- lesson one PPT slides
- mini whiteboards
- stress ball.

Quantitative analysis in terms of processes and equipment are a vital part of successfully running a healthcare setting, both in terms of meeting laboratory testing requirements and using healthcare data to draw conclusions and inform future treatment offers. (Outlined on slide 3 of teacher PPT.)

Notes are available on some slides to support sample answers.

Introduction (5 minutes)

The session begins by informing learners about the topic. Learners will be introduced to the following learning outcome from the T Level specification:

A6.9 To know the purpose of the following statistical techniques when analysing data:

- mean and median
- range – to determine the difference between the lowest and highest values.

Learning objectives:

- to be able to carry out mean, median, mode and range calculations on a dataset
- to be able to apply all four statistical techniques in contextualised questions

The introduction will then transition into the importance of using all four statistical techniques in industry as a whole system approach.

Lesson development opportunities:

Learners could also be asked to map employability skills they will develop from this, for example, collaboration, analytical thinking and evaluation skills. They could also be asked to give their own examples of how they could make use of these in industry, for example, when looking at equipment levels in a laboratory.

Starter (10 minutes)

Slide 4 outlines the four statistical techniques used to analyse datasets. Learners will be asked to define these terms to identify prior learning of the topic from their GCSE Maths curriculum.

Throughout the activity, the tutor should circulate and offer targeted support to gauge an idea of progress and help develop or strengthen learner responses.

Feedback at the end of the activity could be obtained in various ways, including orally or through progress checks. A visual of the MMR definitions from the slides is recommended for the feedback phase.

Delivery (15 minutes)

The session moves onto an activity where learners will be asked to try each technique on the given datasets from slides 5–8.

This learning will help establish techniques before learners are able to apply them on contextualised questions. Healthcare data, including the prevalence or incidence of conditions, are often analysed by looking at each of the MMR values and drawing conclusions, particularly when comparing one cohort of patients to another, for example, looking at incidence rates of coronary heart disease in males compared to females, and analysing the frequencies overlap in different age groups and how widely the data is spread around the mean value. Any healthcare professional would benefit from being able to process raw data to help make these comparisons.

The emoji meter on slide 9 can be used as a learning checkpoint to gauge understanding in the classroom. (The values are open to interpretation by the learners themselves but, typically, '4' indicates their understanding whereas '1' suggests too many gaps in their knowledge or ability to apply the information.)

Worked examples and task one (30 minutes)

Learners will be tasked with their first set of exam style questions (slides 10–11) on the topic. These questions are contextualised, and learners will be expected to use their knowledge of the techniques to draw out what the questions are asking of them.

The learners should show their workings on mini whiteboards, and after the allocated time, the solutions (available on the slides) should be made available to learners to mark their own work or that of a peer. Further review of workings can be undertaken once the tutor has collected learners' work.

At this point, the teacher can display slides 10 and 11 which show questions that are similar to what learners will face in T Level core exams.

The emoji meter on slide 12 can be used as a learning checkpoint to gauge understanding in the classroom.

Learners will be asked to complete data task one from the MMR worksheet, following which they will receive teacher delivery of slides 15–19.

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Delivery (10 minutes)

The teacher will deliver the next subtopic (grouped data), including calculations of grouped averages, with worked examples demonstrated in slides 15–19. Group averages are often used in studies or research that involves a large number of participants, for example, when analysing census data.

The emoji meter on slide 14 can be used as a learning checkpoint to gauge understanding in the classroom before the learners move onto the subsequent worksheet tasks.

Task two (25 minutes)

Learners will be asked to attempt task two on slide 20.

Responses can be obtained in writing or orally. Stretch and challenge questions could include:

- What steps did they take to process the data?
- Are there any limitations to the raw data provided?
- Why would a healthcare professional find it useful to calculate the mean, mode, median or range?

Lesson development opportunity:

Another recommendation for this task is to allocate learners in pairs so they are able to work collaboratively. Each learner will attempt calculations independently, compare their results and develop them if needed.

The emoji meter on slide 23 can be used as a learning checkpoint to gauge understanding in the classroom.

Task three (15 minutes)

Learners will be asked to attempt task three on slide 24.

This task includes an extension task on the worksheet which contextualises the need for processed data to meet hospital testing needs.

The teacher should encourage learners to reflect and discuss their findings. They could also discuss:

- Safe handling and cleaning processes and the time these would take to meet needs.
- Costings and staff requirements.
- Having a surplus of test tubes to cover any virus or infection outbreaks, for example, flu, although they should also discuss the possible limitations of storage.

The emoji meter on slide 25 can be used as a learning checkpoint to gauge understanding in the classroom.

Plenary (10 minutes)

Last one standing: statistical techniques on slide 26.

Equipment required for the activity: stress ball.

This is an elimination game used to engage learners at the end of the session.

An alternative theme could be selected for example, data handling.

With learners standing, a stress ball will be passed around. Anyone receiving this ball has to say a word related to the theme identified at the beginning of the game. If correct, they remain standing. Alternatively, the teacher may call out learner names to pass the ball to instead of the ball being passed around for safety.

Learners will be knocked out of the game:

- if the same word is repeated

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- if they are not able to think of a word
- if the word is not related the theme.

Learning outcomes and objectives should be revisited at this point, with opportunity for learners to ask questions on slide 27.

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