PREPARING FOR UNIVERSITY

FutureLearn MOOC

Notes for teachers

Week 7

University of East Anglia

NURTURING BRIGHT FUTURES

PRE UNIVERSITY MOOC

The Preparing for University MOOC was developed to equip students for the challenges of the university learning environment. The lessons focus on specific skills while reinforcing skills learnt in previous lessons throughout the 7-week course.

At university instructions are often not as specific as students would like them to be, so instead, students have to tackle questions and learn through feedback and discussion with their peers to understand how they might improve next time. The course is reflective of this process, and involves students completing specific activities with minimal training, taking time to reflect on their own skills, and discussions with teachers and peers.

The following notes will guide you through the series of weekly steps and activities of the Preparing for University MOOC. The notes will explain the rationale behind some of the steps and suggest questions you might ask to your students to guide them through the learning.

University of East Anglia

NURTURING BRIGHT FUTURES

WEEK 7: THE POWER OF DATA

Data is an important source of information that can be used as evidence to support an argument. This week, we will discuss how data can be used to support an argument and engage students in some maths problems to help illustrate how data is important in different disciplines.

Activity: Introduction to the power of data

STEP 7.1: **Introduction video**

The video in this step underlines the importance of data in all subjects, particularly in the sciences. It emphasises that we should not fear data, as data helps us to understand the world.

You might like to discuss the following with your students:

• How do your students feel about data?

• Does it concern them or are they excited by it?

We use data in our day-to-day lives, sometimes without even thinking about it. As one example, in a global pandemic, data is constantly presented in different ways, especially modelling a projection of what the pandemic might look like in a few weeks or months.

With your students, explore:

• What data they view daily (from data in the news, scientific facts, to likes on their social media accounts)?

• What their reaction is to the data they are presented with by the media?

• What the data tells them and how much it informs them of facts, current affairs etc?

University of East Anglia

Activity: Introduction to the power of data

STEP 7.2:   **Data in different disciplines**

In the video, staff from different university disciplines talk about where they come across and/or use data.

It is important for students to learn the skills which will enable them to understand what the data means, and how to question the data. You might ask your students:

- What subjects are they planning to go on to study?

- Where might they expect to come across data in those subjects?

- How confident do they feel in their ability to understand different types of data and be critical of them?

STEP 7.3:   **Using data to support your argument**

In this step, there are three pieces of writing about a new phone, the 'A-tech 3' (the name is completely made up).

Each piece of writing uses data in a different way. Version 1 provides a lot of data to help describe the phone's performance and appeal. Version 2 is more descriptive in terms of words but does not include any supporting data. Version 3 is full of data but much of the data is irrelevant.

After reading the three pieces, ask your students which version they prefer. Student responses to the questions posed can be quite surprising. Many like reading Version 2 as the data is synthesised for them. Others feel that Version 3 is more detailed and useful as it includes many significant figures with some of the data provided, falsely giving the impression of greater accuracy.

An academic would prefer Version 1 – they would want to see references for some of the data, but even more than that, this version provides readers with information and data which they can use to form their own opinions. Interestingly, many students find this version the hardest to relate to, which may suggest that synthesis of data is a difficult skill.

Activity: Handling Data

STEP 7.4:   **Discussion on the A-tech 3**

In this step, a university lecturer is discussing data with some sixth form students. Students are asked where they use data. One student suggests that they might use data from the university league tables to decide which university to apply for. Another student discusses the difference between data and opinion.

The students discuss that the interpretation in Version 2 is easier and more useful. It is a fascinating discussion to listen to because the students don't find Version 1 easy to handle. It seems like the students prefer reading someone's opinion compared to being presented with the data (Version 1), which allows them to think for themselves.

In the discussion, one student refers to the use of unfamiliar units. At times, students can really struggle with conversion between units.

One student, who prefers Version 1, has the idea that they need to have the data to make their own comparisons. However, they'd like to hear someone else's opinion first.

At the end of the discussion, there is a hint towards the necessity for independent study at university because you are not always given all the information you might need. This is an important point to flag with your students.

STEP 7.5:   **Thinking about handling data**

In this step, we discuss how a student might come across data that might not be in the form they would like to use. This could relate back to the video in the previous step where one of the students say they don't like working in millimetres, preferring to convert data they found into centimetres. Doing this would be quite a basic manipulation of data. Other types of conversions might involve taking numbers and re-working them into percentages or proportions. For example, in the case of COVID-19, we are often given data in the percentage of the population of a particular age group who might need to go to hospital. In this situation, the people writing the news reports have taken numbers from the scientists and reworked them into data with the aim to better inform the public.

Activity: Handling Data

STEP 7.6: **Understanding numbers**

In this step, we note how numbers are given in different forms, for example, some as decimals, others as fractions etc. We ask students to have a go at reworking the numbers so that they are all in one form and can then be put in order. The answers are provided in a video in the following step.

STEP 7.7: **Solution to the series of numbers question**

The video gently walks through the process of converting numbers to decimals and sorting them into order. Students can check their answers. The key point from the video is that we convert the numbers to the same form in order to compare them. This sounds obvious but students often don't do this with their own data.

STEP 7.8: **Comparing weights of cakes**

In this step, we prepare for the next question which involves fractions and proportions.

STEP 7.9: **Solution to the cake question**

This step provides a clear breakdown of the maths needed to work out the problem.

The next problem is about converting between different types of units. When looking at data from different countries, it is important to note the different units that are used so that clear comparisons can be made. A student going into journalism or politics might find they have to do a lot of this. The UCAS tariff score is an attempt of put different qualification grades on a single scale to allow direct comparisons. This is a form of converting units.

Activity: Handling Data

STEP 7.10: **Looking at a problem with a historical context**

The first part of this step is the solution to the problem of the people who weigh different amounts.

Students might expect to be given data such as numbers of lb in a stone or kg to lbs but they must be encouraged to find this information out for themselves, and to identify the information they need to answer the question.

Following this, a similar problem is set, however, this time the focus is different currencies. Information is provided at the start about old English currencies. This might be data that someone studying history could be faced with.

STEP 7.11: **Solution to Bert's expenditure**

This video explains the question, and solution in the previous step. The video also asks students whether they enjoyed tackling the problem. Developing an enjoyment for playing with data can help students appreciate and question the data they come across.

STEP 7.12: **Creating a data set**

We now move on to applying data to studying texts. Not only is data presented and used in sciences and social sciences, there are examples where data is used in all disciplines. In this step, there are three short poems and a graph, which visually demonstrates one aspect of complexity about these poems. In this case, the data set is the number of words with a different syllable length which will need to be converted to a percentage of words with a different syllable length. The question is to decide which poem is represented by which column of data on the figure. The video in the next step gives the answer.

You could discuss with your students:

• What is the usefulness of displaying the data as a graph?

• How does a graph help anyone studying the data, and how does this differ from being given the numbers on their own?

In science, differences are displayed on graphs when the important things to highlight are the patterns or trends e.g. a pattern of illness over time.

Scenario: Planning your mission to Mars

STEP 7.13:   **Solution to the question about poem complexity**

This video shows the solution to the question about deciding which poem is represented by which column of data on the figure. It shows the process of creating a table for the data – organising the data for future use. It doesn't show how to calculate the percentage, but hopefully all students know how to do this or can find a source to help them with this process. It would be worth checking that students feel confident in this skill.

STEP 7.14:   **Your mission to Mars**

This step involves a more complex problem for those who might have found the previous questions too simple or for those willing to take on a challenge. It involves thinking critically about data. The step provides context to the problem.

STEP 7.15:   **Your mission to Mars: The data (part 1)**

The bar chart is quite an old piece of data, however it is interesting to note that updated data on this topic is scarce. The table presents data that is derived from data from a range of sources, created specifically for the current scenario.

There are a couple of starter questions to check an understanding of the basic data provided.

In deep space there is zero acceleration due to gravity, so the mass and weight of the astronaut would be 100 kg.

30 days into the mission the astronaut has a 6.45 % reduction in body mass. 6.45 % of 100 so 6.45/100 x 100 kg = 6.45 kg and 100 – 6.45 = 93.55 kg

Scenario: Planning your mission to Mars

STEP 7.16:   **Your mission to Mars: the questions**

The first question asks the students to look at the data and think what it might mean for the astronaut. They need to look at the reductions in fitness and think about what this means.

Students need to go back to the table in 7.15 and conduct some calculations. There are various ways of doing this, but to prepare students for university we recommend asking students to plot the data on a graph in Excel and then ask Excel to plot a scatter plot. Then, click on one of the data points and ask for the trend line. For the first column this would be $y = 0.215x$. As such, for any length of time (x), you multiply this number of days by 0.215 and it gives you the % change in body mass.

For 220 days, the calculation would be 220 x 0.215 = 47.3 %.

For leg strength, the equation would be $y = 0.25x$ so, 220 x 0.25 = 55 %.

For reduction in cardiac output $y = 0.15x$ so, 220 x 0.15 = 33 %.

According to this data, these factors are considerably affected by space travel. It would be hard to see how the astronauts could function once arriving on Mars, and cardiac output is the least affected of the three.

Question 2 requires the students to see the enormity of the problem of space travel – the time it takes to get to our nearest planet and how our bodies are not adapted to work in zero gravity.

STEP 7.17:   **Your mission to Mars: The answers**

In this step, we talk through the answers to the questions. Students are posed the question: Is the data realistic? The idea behind posing this question is to get students to think back to the lessons from Week 1, asking them to question the data.

Scenario: Planning your mission to Mars

Your mission to Mars: thinking about the data

The models used to create the data in the scenario outlined here are simple linear models. Modelling requires good data; the data used for the models were collected in the 1970s, and not much more has been done since.

You might like to watch a video on how the COVID-19 (Corona Virus) is modelled and the maths behind it.

Top tips

Week 7

1. Numerical and mathematical skills are essential to success at university. Familiarise yourself with some really useful skills (such as using fractions and percentages) and bring maths back into your thinking, especially if you haven't done it for a while.

2. Data can provide evidence to support an argument. Reading and interpreting graphical data can help solve a problem.

3. Not all problems involving maths are presented as just mathematical questions. Maths is often hidden in word problems and extracting the maths is part of the solution, not just the maths itself.

4. Units are essential in solving problems. You will often need to change units from one scheme, or scale to another (such as from millimetres to kilometres). Being aware of the importance of units and how to deal with them is an important skill as part of your practical maths tool-kit.

5. Although it may not be obvious, maths plays an important role in many degree programmes, and if this is not one of your strengths, don't worry. Support will always be available at university.