

Dear Students, don't be scared of quantitative reasoning!

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Despite regularly creating, manipulating, and interpreting large quantitative datasets in my own research, I still sometimes find myself automatically intimidated when watching a talk where the speaker throws up an unfamiliar equation. I realize that many of my students also view quantitative reasoning and data processing in a similar way, where the mental "I can't do math" shield immediately pops up upon seeing numbers or hearing the word "model". Therefore, I approach the teaching of quantitative reasoning by showing my students that they already do this on a regular basis.

For example, I begin by showing my students a picture (e.g. a turtle laying on a rock in the sun) and ask what they can gather from the picture (e.g. that the turtle is sun bathing) and why they have concluded this (e.g. the sun is shining in the picture and turtles are ectothermic). I explain that quantitative data interpretation is the same process as what they just did -- interpreting patterns and drawing conclusions based on what they're seeing -- except with pictures based on numbers instead of cute turtles. Then, I show them a simple linear regression and explain that this is the same concept as what they saw before with the turtle picture; it just happens to be called a "model" instead of a picture and was created by using numerical data instead of a camera. Finally, we work together to assess what pattern is being depicted by this model, the evidence led us to that conclusion, and the broader implications of our conclusions.

As illustrated above, my approach to teaching quantitative methods is centered around assuaging some of the preconceived notions and fears associated with this topic by using relatable analogies and examples before delving into more complicated subject matter. I find that allowing students to work in small groups seems to ease some of the worry about data processing while also demonstrating the value of diverse points of view when interpreting data. For example, in my Global Climate Change class, students are tasked with evaluating the de-carbonization potential for countries around the world. Each group must research, quantify, and predict trends in their chosen country's GDP, population growth, global carbon emissions and energy intensity of the emissions by incorporating social, political, and climate science data. Groups then present their country-specific findings to the rest of the class and work together to address the pros and cons of varying de-carbonization methods and evaluate the challenges facing global de-carbonization. I find students really enjoy this project and are excited about investigating solutions for a real-world problem.

To try and strengthen the connections between real world datasets and classroom activities, I think it's important to use data that is relevant to their everyday lives and reflects student interests. In the example above, students are free to choose any country of interest (most choose a country that they have been to or where their family originates) and they also choose the dataset that interests them (e.g. social data or political data). I find that students tend to be less intimidated about data processing and more open to data interpretation when that data is more related to their field of interest, as they feel more confident drawing conclusions.

I hope that my students will learn that quantitative reasoning and using data may seem intimidating at first, but that they already think this way in their everyday lives and therefore know more than they think they do. I also hope they learn quantitative reasoning is not simply a STEM field, that in fact diverse views, including those from the humanities and social sciences, are essential components of quantitative reasoning.