Case Studies in Research Methods Pedagogy

Teaching quantitative design methods through exposition

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There are different pedagogical traditions surrounding the teaching of quantitative methods. This case study comprises a detailed account of pedagogy for science-based quantitative methods from an intensive international seasonal school. The case study draws upon one teacher interview, eight hours of classroom observation, written field-notes, teaching materials, two short student interviews and informal research conversations with students across the sessions. In this case, the teacher, who I call Larry, is lecturing on quantitative design within a wider context of hands-on and computational sessions. Here, Larry's pedagogic approach is one of exposition. However, this nominally didactic teaching – the lecture – is shown to convey rich pedagogical strategies and tactics, particularly in terms of pedagogical rhetoric. The pedagogic hook (and locus) of 'teaching through data', a preeminent facet of quantitative teaching [1], is clearly visible, even at this conceptual and discursive content stage as theory is constantly drawn back to data.

I wonder if I'm in the right room. Downstairs another methods school is underway. Here, 23 students, from five continents, wait patiently to learn about applying science methods in social science research. They are arranged behind tables loosely gathered in a horseshoe around a data projector and screen. Teyo is from Madrid, but his project starts in Zurich soon. Christa works in Germany, but she is jetlagged, just back from the USA. Oscar, an international student based locally is clear about his reasons for attending: 'The benefit of having a diverse, international crew around you here is that everyone is kind of sticking together; … we tend to interact quite intensively, in a way that you don't interact as much with your typical colleagues at university'. This community is in its infancy, but once introductions are over, the sense of shared interest, friendship and clusters of expertise grow palpably across two weeks.

The instructor arrives suddenly. Larry, with some 30 years in academia, immediately engages the room: 'Let me just go over the details. I'm going to teach the first two days: [science-based method*]. Module 1 and Module 2, the lecture notes will be up on Github today'. Larry continues: 'Each of these modules has a small problem set that Niklas will be helping you with. Wednesday through Friday will be Niklas and Noah. Monday I'll come back and talk about …'. Larry has prioritised the course and its learning resources, setting out the fundamentals for the students. Next, he turns to himself. 'I'm the director. My expertise is in a lot of things but the major thing is [method*] design'. From the start I notice Larry is open about his pedagogy with the students: 'I will lecture. Format? You should stop me, and ask questions. This should be the format.' And we begin.

Pedagogic resources

"Built for developers" Github proclaims as I source my invitation and frantically log-in, to 'a development platform inspired by the way you work … you can host and review code, manage projects, and build software alongside millions of other developers'. Files appear in an orderly fashion: slides, Stata and R code, maps and attendee lists.

*The case study researcher has to make compromises to protect the anonymity of the case.

Larry's easy style is engaging. 'Have any of you seen this material on …?' He benchmarks the group's understanding, establishes a foundation, and outlines the fundamental need for theoretical grounding and reflections on how to anticipate and interpret results. 'Some of it's a little opaque, abstract, but it's important that you understand it. If anything is unclear - so you should stop me...' Having given cues to the difficulty of material he moves to establish the level of the class, back filling on the basics: 'Let's start off with some basic questions - What do we mean by association? What do we mean by causation?'

To demonstrate theory in action, Larry uses contemporary subject matter (Brexit) as the pedagogic hook. He connects the learners to the research using two types of study: (1) Recently published studies and their data sets ensure the discipline is evoked and 'live' research is drawn into the classroom. (2) These are balanced with the classics -those early 20th C studies that everyone knows - the origin stories that bind the discipline. Larry deploys each in various ways. Sometimes he leans on the chronology of the study in question, step-by-step from beginning to end. Other times, he introduces a study, cuts away and then loops back – to illustrate a key point, or take the class through an expression of research design principle as it happened, or as it might have happened from a speculative perspective.

Pedagogic strategies

Larry is clearly thinking about the sequencing of material, moving through the fundamentals and building difficulty. As he works to backfill knowledge for those who need it, he recognises others in the group who are already au-fait with this material, 'I hope this won't be too repetitive', 'You can correct me'.

Pedagogic starting points

If Larry has a signature pedagogic strategy, it is that he frequently begins with a formula. From this pedagogic starting point, Larry builds outwards – exposing multiple perspectives and routes of enquiry. The structure and rhythm of the class are delineated by these formulae. A pattern becomes familiar:

> Larry: [*holds his hand to projector screen, his fingers touching the equation. Minimal text on a grey background*]. 'Let's think about this formulation.'
>
> Larry: [*Later, on another equation*]: 'So, what is this first line saying?'
>
> Larry: [*Later still*] 'Once we think about subgroups we have a standard formulation, right? What might 'x = x' mean here?'
>
> [He waits. There is silence. The response is slow]
>
> Larry: Go ahead, no, go ahead, no, go ahead! [*laughter*]
>
> Student: [*New male speaker*] Gender?
>
> Larry: It clearly could be gender. [*He waits again, there is a pause*]
>
> Student 2: [*Female voice*] Is it an independent variable?

Larry uses equations. But these don't work for everyone and Larry knows it. In the second session, he clarifies 'You don't have to do all this by hand'. R and other packages can handle the calculations he explains.

Pedagogic tactics

Larry deploys a rich repertoire of in-class tactics as each algebraic expression is clothed in research from a pool of research studies and data sets, following a kind of narrative, if in a very scientific mode. As Larry gestures to different parts of the equation, there are nods of understanding from the floor.

In each case, simple open questions lead to deeper exposition, for example, applying a particular logic in an applied scenario, discussing how an approach or research question can be worked in different directions, identifying limits and so forth.

Then, giving another example of his explicit pedagogy he states, 'I like to walk people through this so you can understand the intuition behind it, I think this is the way you need to think about the P values – it's important to think about how you get to this point.' My ears prick up at the word intuition. Later in the same session, Larry questions his group: 'What are the permutations, right? What percentage of the actual permutations does this [require] being a chance event? Does this make sense? So this is the intuition behind what I've just shown you'. I note down 'intuition'.

I'm keen to understand the extent to which the word 'intuition' has been invested with pedagogical thinking and take this up with Larry at interview the following day.

I: You used the word 'intuition' several times when you were talking to students, I think about 'developing an intuition' … I was wondering if you could talk a little more about why you use that term 'intuition'?

L: Well, that's a good question. I think the idea of these courses is sort of you present this technical material to them [learners], and I want them to understand that, you know, there are all these rules and technical things they need to learn, but that really they need to develop a familiarity with the whole exercise, with … the whole endeavour. And then that once they develop that familiarity … then they will develop an intuition for what's going on, right? And they'll be able to see a problem and have an intuition for how to think about, you know, the treatment or the right treatment. So I think I'm pushing them in that direction… Ultimately the idea is to get them in this comfort zone where they can sort of look at something and be comfortable and self-assured about saying 'Oh yeah, it's this x and this y', right? That's the idea.

Amongst the learners, this approach resonates strongly with Oscar. Later in the cafeteria, he gives his reasons for being here: 'when it comes down to the finer details, it's better to learn from [active researchers]'.

Back in class, the students are making notes - some with pen and paper. Others listen attentively. Next to me a student has the slides open on his MacBook. I increasingly notice Larry's pedagogic use of language as a deft and rich expression of his approach, tactically scaffolding knowledge across different criteria to expose the expertise that constitutes his methodological 'intuition'. He demonstrates generic pedagogic techniques: His body is open to the class, he is questioning and moving. He also demonstrates techniques targeted to his subject and students in context, showing his pedagogic content knowledge[4]: He is drawing out - What *this says,* what it doesn't; what can be controlled, what cannot; where arguments can be made, where limits are encountered, what is important to understand. He looks across faces around the room, turning his head, scanning. 'Right?' His hands measure and space words, underscoring his key terms. 'OK'?

Pedagogic approach

Frequently, methods teachers do not come from educational disciplines, and may lack the pedagogic vocabulary traditionally associated with pedagogical development[3]. However, here and elsewhere we see demonstrated a highly nuanced approach to teaching in which disciplinary language (such as 'intuition' for the logic of the method) becomes pedagogically invested, and is then used in ways that can be understood locally within that methodological, learning community.

The language is technical - but very specific. ‘It’s very important to understand that basic point’. Difficulty and confounding factors are highlighted: ‘It's very difficult to identify...’. Larry uses specifying language to suggest overall trends that allow confidence in the methods chosen: ‘With very few exceptions...’ He gestures to the influence of different international contexts: ‘in development contexts …’ Perhaps most importantly (across all these indices), Larry is explicitly modelling ways of thinking: ‘You can think about [X] by [doing Y]’, ‘This is a good way to think about the research design ...’. He is demonstrating ways of thinking, to show how he ascribes value as an active researcher and teacher, modelling where reflection and attention should be place: ‘We'll talk about … because I think that it's a good way to think about [research] design ...’ Larry also models critical thinking and reflexivity, ‘You must always ask yourself ...’.

As he promised, Larry receives questions warmly, ‘Good question. Good question’. And he gives straight answers frequently, ‘Yes, you could … No! But you should … No, not quite ...’ He gives time to different student-supplied scenarios and concerns. I notice Larry is always ready to seize on lack of clarity, to recap. He reads the room - the knitted brows on front row. Madeline leans forward, chewing the end of her pen, frowning behind her glasses. Two Dutch students, are whispering, their eyes glued to the board. These eddies in the flow of the class are vital. Students question spontaneously, and bring pre-prepared questions. These are strong motives for taking the course as I discover in conversation with Alana. When we talk, she says ‘Prior to this course, I had some questions in my mind that were not resolved just by reading articles, so I hoped I could get some answers’.

At the end of the day, Larry rounds off the first class. ‘OK, 4 o’clock. Do you have any questions? Have I totally confused you? Do you know what is going on? Tomorrow, I’ll give you a couple of examples to give you a better intuition … then it’ll be crystal clear.’

Pedagogic strategies

Larry's talk is building that advanced statistical knowledge using established, familiar verbal (and algebraic) building blocks. Threshold concepts [2] - those points of understanding that must be gained before a learner can transition into further knowledge - are outlined on the way to more advanced and complex material,

Learning strategies

While there are no ‘tasks’ to speak of, beyond active listening, Larry’s teaching approaches, strategies and tactics are matched by some student strategies that gravitate around the anticipation, or experience of the particular challenges of the method. Even in this seemingly didactic setting, knowledge is not transmitted, it is modelled, scaffolded and negotiated, actively in a shared endeavour.

References

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This case study is part of a series produced from the Pedagogy of Methodological Learning study. Look out for them on the NCRM website. We also appreciate feedback to inform future work.

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