Teaching Quantitative Methods for the First Time

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Who is Who

Niccole Pamphilis

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- Training
- Experience teaching
- Why this session?

You?

- What subject/field do you come from?
- Experience teaching
- Why this session?

Discussion Point

What is your biggest concern about teaching methods; or teaching in general?

My biggest fear was not seeming well-informed or smart enough

Consequences: over technical course

Thought Exercise

Think about teaching a methods course and write down who is in the class; what does it look like?

Did you consider:

- How big is the class
- Why are the students there
- What is your role

Build your own Adventure Course

You could teach the same topic many times

But the composition of who, where, and why will change the presentation

If you take a one size fits all approach it can be a difficult experience

1 class; 2 tutorials

Who are you teaching

Consider the cohort you are teaching first

What is their prior experience with the material

None: May need to assume no knowledge including:

Language used

Basic math skills

Presentation of assignments

A little: Prior exposure but confidence varies

May need a quick review session of prior knowledge expectations

Can start to push ideas, models, and tests more

Consider the mix, same for all or different?

Who are you teaching, cont.

Why are the students in the course

- Want to take the course
  - Tend to be more engaged
- Told to take the course
  - Mixed levels of engagement
- Must/Need to take the course (requirement of degree)

Who are you teaching, cont.

- Where are students coming from?
  - Same/ different field as you
    - Can you use examples from your own field and work in the course?
  - Same/ different field as each other
    - Do you need to balance examples from across fields
- Consider student trajectories/what is next
  - Not all students have the same goals
  - Part of their degree
    - What is important here: core concepts
  - Possible future graduate students
    - What is important here: extensions/uses
  - Employability skills
    - What is important here: applications

Who are you teaching, cont.

Can you think of any other student traits that might alter how you teach?

- Language
- Cultural

Consider the Institution

- Size of institution and resources
  - Size of teaching team
    - Number of Lecturers/GTAs
  - Individual or team taught courses
- Size of classes
  - 20 versus 500 (interaction with students)
  - Ability to shape assessments (respond to challenges)
    - Number of assessments
    - Change assessments
    - Marking assessments
- Example: US versus Scottish Universities

Student Expectations

Consider the students' expectation of the course

Connects back to why a student is a particular course

Level of assistance expected:

- Access to slides and handouts
- Drop-in office hours/lab support
- Formative feedback

Level of accessibility expected of you:

- Before/after class
- Office hours
- Email

Feedback expected to receive:

- Just a grade
- Notes on what went wrong
- Comments on how to improve

What are they expecting to leave the course knowing (clear ILOs will help with this, more later)

Teacher's Expectations

What a student expects from a course and what you expect students may not align

What I expect:

To show up on time, every time

First time teaching: Don't be late, don't have excuses

Teaching now: If late please be respectful and quiet when entering
If you have questions on missed material attend office hours for support

To ask questions if things do not make sense

First time teaching assumption: No questions, no problems

Teaching now assumption: No questions, big problems

- Afraid to ask
- Do not know how to ask

Teacher's Expectations, cont.

- Seek help when needed
  - Be prepared for this not to happen until too late
  - Try to offer warnings to classes early and often on where they should be
- I make sense
  - I do not always make sense outside of my own head
- Upfront expectations on first day of class
  - This means sitting down and being honest with yourself of how you expect students to carry themselves in class
    - What is reasonable to expect
    - What should you tell them you expect
    - What is unique to you and may require accommodation on your part

Reality

- Not all students the same type of student you were/are
  - Who I was shaped my expectations of students when I first taught
  - Not fair to students or to you
- Some students will wait until too late to seek help
- Some students only seeking a passing grade
- Everyone's institutions operate from a little bit different to VERY different
  - MSU versus Glasgow
- Students might be afraid to ask questions
  - Afraid to show they do not know
  - Office hours for emergencies

Questions

Questions

Break

Discussion Point

What do you think the most important element to cover when teaching intro methods?

- Theory
- Derivations
- Mechanics
- Application
- Coding
- Interpretation

What to Teach

Where do you start and where do you end

How long is the course?

Consider your course in the scheme of things

- First course in sequence or not?
  - First: Start with the basics and core concepts
    - Check int to see what is covered next
  - Sequence: Check what is covered before/after
    - (Recently found 4 weeks of overlap in a course)
- One-off course?
  - What skills are essential

What to Teach, cont.

- Introduction or advanced version
  - Students first exposure to material or not
- What is the goal of the course
  - Crash course to learn everything
  - Ability to see it and think critically of work
  - Ability to do it in own research

What to Teach, cont.

- What Level do you teach it at
  - Low, middle or high end of complexity
    - Always at least one student who thought it was too easy
    - Always at least one student who thought it was too hard
  - How to you balance it?
    - Personally: I start slow and with basics, then a I ramp it up in terms of speed and details as we go on

Understand the Challenges

- Learning a new language
  - Do you offer a template on how to answer questions?
    - What do you think?
  - Learning coding
  - New degree of freedom of interpretation
    - Grey area of choice of method, variable, and modeling
    - Some students will be hesitant that there is not just ONE way to do things

State the Challenges

- Admit what students should find hard
  - Might increase willingness to seek help
- Relate to challenges you have faced when doing this work
  - Students have told me they appreciated knowing they were not alone in struggles because fellow cohort members always seemed to "get it"
- If brave enough, code in real time to show frustration
- Be honest on necessary pre-requisites
  - Expect some people to not have met them, and build it in
  - Example: Order of operations and multiplying by 10
  - Reference section in your course (not taught but available)

Clear ILOs

Clearly specified Intended Learning Outcomes

Determine what students will know when they leave your course

Tell students in course guide and course description what they will be expected to know

Make sure you teach to your ILOs

Make sure your assessments map on to your ILOs

Frustrating courses are ones that do not cover what students expected and assessments do not test those skills

Frustrated instructors are ones where students are not connected

You versus Best Practices

- Important to teach standards expected
  - What a table should look like
  - How to create clean code files
  - Data management
- Not what is your personal preference
  - I have a format I teach hypothesis testing in and want to see answers put it
  - Do not accept

Study Recommendations

Methods courses are different than substantive courses

Study habits for a course on public opinion or voting behaviour are likely not going to work for methods courses.

Repeated exposure and practice

Elements build off of earlier learning

Cannot typically skip sections you do not understand and still pass; probability and p-values

I tend to start on day one with my ideal study habits for the course

- I tell them I do not expect that they will do this,
- I talk about reality of life and study balance
- I get honest about how the course is going to work
- Then address ignoring my recommendations

Study Recommendation, cont.

My study recommendation to students:

- Do assigned reading before class
- Attend all classes and take notes
- Re-read assigned reading
- Attend office hours or email when material stops making sense, right away, not a few weeks later

Ideal situation, not always the feasible situation

Work/Life balance
Unexpected events/ crises

Course Guide

- Course Guide or Syllabus
  - Can be viewed as course contract
  - I Review this in class first day
- What a student needs to know:
  - ILOs
  - Assessments and due dates
  - Readings and weekly breakdown
  - Textbooks
  - Contact information
  - Clauses developed through University protocol
    - What is plagiarism
    - How to file for extensions
  - Clauses developed through your learning experience
    - How to send an email to staff
    - Feedback policies
    - No primary data

Textbooks

How to pick a textbook

Most textbooks would not be how "you would write it"

Do not need to use it all

- Pick certain chapters, libraries can create digital files for students

Mix and match books and articles

Offer alternative perspectives

- Basics of methods, bare bones
- Moderate book on technical detail or focused on coding
- Detail oriented book

Do not repeat textbook verbatim in class

Discussion Point

What is the best way to assess/grade learning in an methods course?

Questions

Questions

Break

Formative Assessment

Formative feedback is key here to develop understanding of material without consequences

Group work:

- Students teach each other
- Real-time feedback
- Application of material learned

Practice exercises:

- Independent with answer key

Lab work with feedback

Discussion forums on key topics

Mini-quizzes

Formative Feedback Resources

Angelo, T. A., and Cross, K. P. (2012). Classroom assessment techniques. Jossey Bass Wiley.

Cizek, G. (2010). An introduction to formative assessment. In H. Andrade and G.J. Cizek (Eds.), Handbook of formative assessment (pp. 317). New York: Routledge.

Moss, C. M., and Brookhart, S. M. (2009). Advancing formative assessment in every classroom: A guide for instructional leaders. Alexandria, VA: ASCD.

`https://www.celt.iastate.edu/instructional-strategies/evaluating-teaching/classroom-assessment-techniques-quick-strategies-to-check`

Summative Assessment

Sat-Exams

- Assess factual knowledge
- Formula sheet allowed or no/ who makes it?

Essay

Project

- Build on taught material and demonstrate learned skills

Lab Assignments

Presentations

- Teaching element

Just connect back to what you intended to teach:
knowledge of skills, replication, application...

Feedback

Do not just point out what is wrong

Me:Only what needs to be fixed, no comments mean well done

A little encouragement goes a long way

Many students assumed lack of positive comments meant nothing done right

Constructive feedback, how to improve it

I have found a lot of students do not mind being wrong, as long as you explain how to do better next time

Next day policy

Formative feedback often

Discussion Point

Do you think an intro stats course should be teacher-led or student-led?

Student-Led Learning

Benefits to active to student learning

Resources if interested:

- https://www.lifescied.org/doi/full/10.1187/cbe.13-06-0115
- https://teaching.charlotte.edu/sites/teaching.charlotte.edu/files/media/files/file/InstructionalMethods/SevenPrinciples.pdf
- https://www.iddblog.org/student-centered-vs-teacher-centered-classrooms-which-and

Software Choice

Institutionally constrained

Field constrained

Do not discount students ability to learn and master coding

Trade-offs on accessibility and cost

Software less consequential in intro courses than ability to interpret and talk about results

I make everyone do work by hand first anyways, stats programs are fancy calculators

Discussion Point

What software program would you teach?

How would you teach it?

Teaching Coding

- Find a good book
- Consider using a consistent data set example throughout
- Make your own annotated handouts that fit your sytle
- Consider if it is worth making short videos for review
  - Supplement not replace
- How much support is needed
  - First course, expect a lot
  - Later courses expect less
- Offer additional resources
  - How to read help files
  - Internet guides, I like UCLAs website
- Weekly session or bulk sessions (I vary based on setting)

Presentation of Material

I stress repetition is key to learning this type of material

I present material repeatedly in different formats

Start with narrative/story of what we are doing

Then we work through mechanics of what we are doing

THEN we learn to code it up

Opportunities for Questions

- Show up early and stay late
- Office hours
  - Individual
  - Groups
- Responsive to emails
  - 1 working day
- Review Session

Discussion Point

How might you attempt to avoid students' shirking lessons

Is this your responsibility?

- Students as teachers
- Active learning
- Relevant examples/exercise
- Clear connection between content and application
- Varied teaching styles
- Breaks
- Attendance Policy
- Participation mark (what does this mean)

Check-ins

- Low cost check-in opportunities
  - Group activities where each group reports back to class
  - Weekly individual assessments
  - Summative Assessments spread out throughout semester
  - Circulate in your class and "make" students talk to you
  - Be clear about what support you offer in terms of teaching
    - Office hour confusion

My Missteps

- Do not try to cover too much
  - They do not need to know everything you know, sort out what is key
  - You might run out of time
  - Have optional material if move too quickly
- Do not over-complicate examples
  - Likely to confuse students unnecessarily
  - If doing work by hand, likely to trip yourself up
- Code in real time, all the time...lots of mistakes
- Do not get too technical too soon

Timing

Too much at once is overwhelming

50 minute sessions, break for questions throughout

2 hour sessions, take a proper break part way through

Mix long sessions with group activities about current topic

If a few shorter session break them up strategically (new material, handouts, coding)

If recording, do it is shorter topic sessions
easier to record, easier to watch, easier to access

Things to Try

- Mix up format
- Include relevant videos
- Speakers?
  - Someone in your subject is expert on method
  - Research Design: 3 speakers this past year
- Debates on approaches
  - Frequentitst versus Bayesian
  - p-values; pre-registering; p-hacking
  - Can you ever have population data
- Relevant news articles that misuse or misrepresent data
- Real Data examples
  - Correlation examples
  - Correlation game
- Peer observation (of yourself and others)

Draw Students in

Students design data sets

Build examples around random facts

Class data set survey

Effort

You can make a difference by showing compassion

Be honest about challenges

Be willing to help with questions

Anonymous question posting might be helpful with shy classes

Help people over hurdles

Students can quickly tell when you care about the class and when you are there because you have to be

General Comments

- Be confident
- Be honest if you do not know or mess up
- Be aware of when students are afraid to tell you they are not following
- Be ready to adapt
  - What students knew the first time you taught will not be the same as time moves on (excel)
- Be prepared to change everything completely when you do it next time
  - Change order
  - Change examples
  - Change depth
- Be willing to try activities out and bin the ones that do not work

Good Luck

It will not be perfect the first time

It will not be perfect the last time

Good Luck

Questions?

What do you wish I had covered?