How to give mathematics seminars

Lindon Roberts, Mathematical Sciences Institute, ANU (lindon.roberts@anu.edu.au)
with Pierre Portal (ANU)
A seminar (or video, thesis, paper, ...) is a piece of communication. You are talking to smart people, so if they don’t understand, that’s your problem!

- Who is the (expected) audience?
- What do they already know about the topic?
- What are you trying to convey (1 idea)?

You are telling a story: introduction, coherent arc, end with a punchline
Exercise:

1. Pair up with someone who studies a very different area to you
2. Explain your thesis topic to them (3 min) — questions are encouraged!
3. They will then explain your topic to another pair (1 min per pair)
4. Repeat

What did/didn’t work?
• Give proof details (otherwise hard to get a ‘taste’ of the topic) — but only showing key lines can be a good way to go

• Don’t show full generality: simplest interesting case is ideal
  – Mention more complicated cases for the experts
  – “In this talk, I will work in $L^2$, but everything works for $L^p$ ($1 \leq p \leq \infty$) if you…”
  – “I will work in $\mathbb{C}$, but this works for any field…”

• Vary level of rigour/precision: some definitions & theorems in full details, some as heuristics

• Examples & pictures are always useful

• Notation: consistent, clear, minimal

• Cite yourself with initials only [P. P. & L. R., 2021]

• What are you trying to ultimately convey?
Board Talks

- Common in pure maths, unusual in applied maths
- Slows you down — makes it easier to follow
- Prepare detailed & clear notes
- Do everything from memory, or with minimal checking of notes (slows you down, stops you skipping ahead)
- Handwriting: neat & large
• **Beamer** allows you to generate slides in LaTeX (but some use Keynote or Powerpoint)
• Pick a template that you like: not crowded, but some repeated information can be useful (e.g. name, title)
  – These slides use a modified version of metropolis
  – Slide numbers are very helpful for Q&A
• Don’t overcrowd information: nobody reads walls of text
• Avoid cross-references (I don't remember what “Lemma 2” or equation (3) was)
• Including citations is good
  – Formatting: [Jones & Smith, 1998] or [Jones & Smith, *Invent. Math.*, 1998] is better than [1], since audience can write down immediately (e.g. apalike in Bibtex)
• 1–2 minutes per slide *including* ‘padding’ slides (title, outline, etc.).
  – Pierre is more conservative (5 minutes per slide)
Figures

**Figure 1**

Comparison to data

Giving Mathematics Seminars — Lindon Roberts (lindon.roberts@anu.edu.au)
Figures

- Keep it minimal: drop unnecessary lines, use short labels, few figures per slide
- Size matters (figure size, line width $\geq 2$, font size)
- Many plotting packages allow you to write LaTeX in labels
- Plots should be readable in black & white (vary linestyle and/or markers)
  - Yellow usually invisible, 1 in 12 men are colourblind (red/green most common)
- Obvious stuff: legend (not blocking important things), axis labels & values sensible, helpful captions
- Talk! Explain what you are plotting, which line is which, give us time to understand (and hints are good: “higher curves are better”)

Tables? Almost never a good idea (use bold/colours/etc. to direct attention)
Public speaking

- Talk to the back of the room (unless using a microphone)
- Look at the whole audience while speaking (especially for board talks)
- Don't rush
- Vary pitch — make us want to listen to you
- Don't read every word on a slide (or every term of an equation)
  - Talk around each point
  - Slide text shouldn't be full sentences
- Observe others: what do you like/dislike?
- Q&A session:
  - Actually answer the question! Don't lie ("I'm not sure, but..." is fine)
  - Ask good questions: ≤ 2 sentences, last sentence ends with a question mark
Practicalities

- Always mention co-authors, acknowledge funding bodies, thank organisers (if relevant)
- Practice
- Double-check your notes/slides (mistakes, hard to read, ??, embedded videos, etc.)
- Check the room beforehand: layout, IT equipment
  - Projector works
  - Using laptop or from USB (is there a desktop?)
  - Have all required cables
  - Chalk/markers/erasers available? Which markers work? What colour(s) will you use?
- Start with an empty board, even if using slides
- Stick to time
- Arrive early, meet the chair, don’t leave immediately afterwards (if possible)
These are my views (with input from Pierre) — you may disagree. Ask yourself:

- What one thing do I want my audience to remember?
- Would I enjoy listening to my talk?
- What talks/lectures have I enjoyed/disliked & why?

Other views

- [https://people.bath.ac.uk/eas25/pgaway_2015_annotated.pdf](https://people.bath.ac.uk/eas25/pgaway_2015_annotated.pdf)
- [https://faculty.washington.edu/heagerty/Courses/b572/public/HalmosHowToTalk.pdf](https://faculty.washington.edu/heagerty/Courses/b572/public/HalmosHowToTalk.pdf)

Questions?