

## Pointers for public speaking about math

Nicolas Boumal, Oct. 1<sup>st</sup>, 2019, updated Sep. 11, 2020.

### Open with a non-technical message.

What are we learning today? What's the point?

### Introduce technical tools only as a means to an end.

By default, your audience doesn't want to make the effort to learn something technical without motivation; and even if they indulge you, the concepts may not stick long enough to be useful later in the presentation. It's hard to remember a purely technical fact. There should be a cookie worth the effort.

### Flashing a proof achieves little.

Your audience cannot read a technical slide that appears for a few seconds, let alone comprehend it. The only legitimate use-case I can imagine would be to convince your audience that the proof is short, but even for this I'm not sold: you might as well just say out loud that the proof is "half a page." This sentence and the flashed slide convey the same amount of information. Also, when your audience gets the sense that they didn't follow you for a moment, you run the risk of them disconnecting completely.

### Doing math on the board is hard. Rehearse it.

Furthermore, doing math on the board takes time, because you need to carry your audience with you. There is only one way around it: practice. Rehearse all of the math you intend to do live, and ideally all of the math you anticipate you may have to do live if the audience asks.

### Make a clear list of the messages you want to convey.

Do this before making slides (if you make any). Depending on your messages, choose your medium: is this better explained with slides? Is that better explained on the blackboard? Don't hesitate to switch back and forth if the room setup permits it (figure this out ahead of time). Only after you picked your messages should you start working on your slides / blackboard notes. It's much easier now: everything you say must contribute to conveying your message (and yes, jokes can help with that). Everything else must go.

### About messages: don't just answer "What?"—answer "So what?"

This connects back to technical content and motivation. Ask this of every one of your main messages and supporting messages: so what? If you don't, your audience will.

### Anatomy of a theorem: your audience needs to understand the claim, and its relevance.

We must understand the characters (variables, sets, objects of various kinds) and the assumptions. Importantly, we want to understand what the theorem "is really saying" before we go into the proof. Ideally, we want to get some sense of why the assumptions are there. Only after we know what the statement says and why we care, can we embark into a proof.

### Anatomy of a proof: proofs are the execution of a strategy.

That execution can be messy: some tedious bounds and integrals here and there, annoying corner cases of lesser importance. The details are important of course, but they are not interesting. What your audience may remember is the overall strategy: how could one come up with this proof? What's the key mathematical insight? In short: what is the take-away that might serve us in another context? Why is the claim credible? Lead with this.

### Proofs are hard to absorb.

If the theorem and the proof together do not fit on a single slide, better to do the proof on the board (with the theorem statement on the screen if you prefer). Otherwise, one often ends up moving back and forth between slides, which is all but impossible for your audience to follow. Blackboards have permanence. Use it. Also, writing on a blackboard limits your speed. That's good.

### When you are the speaker, the room is yours. Take control—respectfully.

The table is in your way? Move it. The computer is awkwardly far away from the screen, making it hard for you to point at things while controlling slides? Move it. There's noise outside? Close the door or window. The lighting is wrong? Change it. You may want to ask for permission of course, but it's not rude to ask.

### When you are the speaker, your duty is to deliver, not merely to try.

This means that if the projector doesn't work, or there is no blackboard even though you thought / were told there would be one, or the internet is down and you can't access your slides—it's on you to adapt. People will help you fix the issue, and if the circumstances are beyond your control, your audience will sympathize, but they still expect to learn something from you: that's why they showed up. Adapt, and they will be forgiving.

### Stories are engaging: use them, to a point. Make them lively.

Stories can be great pedagogical devices. They require just as great a delivery. Rehearse them multiple times. Make sure your audience understands the characters and the rules. This requires emphasis and time. Going one step further: all public speaking is storytelling. You can try to construct your whole presentation as a story. Stories have characters, tension and a resolution.

### It's not about you. It's about your audience.

Who are they? What are they getting out of this?