

# DRP Workshop Part 1: How to Present Mathematics

(More Detailed Edition)

Directed Reading Program

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## Acknowledgements

We spoke to Prof. Bélanger-Rioux and Prof. Hundemer when preparing the advice for this part, and the next part on writing mathematics. Most of the advice here comes straight from them, so thank you!

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# Disclaimer

Ironically, these slides are an example of what your slides should *not* look like. We took the original slides and tried to include most things we verbally said too, since not everyone could attend the workshop. More on this later.

- 1 DRP-Specific Guidelines
- 2 How to structure a math talk
- 3 Proofs?
- 4 Considerations
- 5 Pedagogy



- 1 **DRP-Specific Guidelines**
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- Please keep the talks to **10 minutes maximum**. We have to be out of the room by 18:00!
- Give all the acknowledgements you want to give at the end of your talk, after the conclusion. In particular, you should thank your mentors for all their help this semester.
- Decide what the format of your talk will be.
  - Slides or blackboard or on a tablet? Since the talks are short, it might be best to do them on slides, but it's your choice in the end. Just please let me know by **23:59 on 28 April 2022** so we can make sure all the tech works smoothly.
- **Intended Audience:** someone who's finishing up their U1 year in math.
  - Analysis 1/2, Algebra 1/2, maybe ordinary differential equations (ODEs). If your talk will be about something not covered in these courses, you can heuristically introduce the concepts. The aim is not to give students a comprehensive introduction about your topic, but rather a general overview and the curiosity and confidence to learn more.

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# The Beginning

- Begin your presentation with a *big-picture* description of your topic. You should strive to make it as accessible as possible, just in plain English, what is your project about and why is it important. Why?
  - Gets the audience in the right mind-set for your topic: there are a lot of talks, and the event is long, so it's good to set the stage.
  - By starting with something simple, the audience has the confidence to be able to follow along.
- You may have seen talks give an “overview”, or a table of contents. Since our talks are very short, this probably will not add much value, so we could recommend not doing this since time is scarce.
- It's ok to be fun!
  - You can start with something funny, intriguing, or out of the ordinary; it will capture the audience's attention, and break the monotony of 3 hours of talks.



# The Middle: Less is More!

- **Less is more!!**
  - It's better to choose one result, theorem, or topic, and explain it thoroughly, than to try to give a brief overview of everything you've learned. If you cram too much information in, you risk overwhelming the audience.
    - If you choose to do a write-up, you can always direct the audience to it if they want to learn more, or you can include sources that you liked.
  - The same applies to slides – the slides should be used as an outline, to guide what you will talk about, not as a device to dump information on.
    - You may want to just put theorem statements, definitions, or diagrams on the slides, then verbally talk about the motivation, big picture, and connections between topics.
    - You don't want to over-load the slides, since the audience will then have to multi-task between reading the slides and listening to you.

# The End

- Finish the talk with a “so what”.
- Ask yourself: *If there is one thing that I want the audience to take away from this talk, what is it?* You should end your talk with this point.
- Direct the audience to resources that they can read if the talked piqued their curiosity. This can be in the form of a bibliography.

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# When should I include a proof?

- It depends:
  - **Rule-of-thumb:** *what is the most important thing I want to convey in my entire talk?*
    - If a key part of what you did this semester or want to present is a proof, a technique, construction, or trick, then by all means present it! But devote a generous time to it to make sure it's not rushed.
    - If the proof is not central to your work, but is illuminating, you can also include a proof sketch, then direct the audience to an external source or your report for the details.
    - Otherwise, avoid!
  - The same applies to derivations: try to avoid technical derivations, as they probably will not add any value. You can just state the main tool(s) that is (are) used, then present the result (e.g. “By Taylor expanding and simplifying, we obtain the following...for more details, see [some source]”).

- When deciding what to include, ask yourself: how can I maximize what the *audience* takes away from the talk? Remember, the objective isn't to make a comprehensive introduction like a lecture, but to give the audience a general idea of what you're doing and why it's important.
  - You want to give them the tools and motivation so they can go and dig deeper if they're interested.
- Make it “personal”:
  - Add your personal touch to your talk: you can talk about what part was very interesting to you, or what motivated you to learn the topic, or what in particular you thought was difficult and better ways to conceptualize it. You can also connect it to classes members of the audience might have taken.

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## Things to keep in mind while preparing and giving your talk

- You absolutely **must** practice, at least one time, in advance, in order to:
  - Make sure you are within 10 minutes. Generally, you talk slower when you practice with yourself than when you're in front of an audience (public speaking can be stressful!), so if you clock in at around 9.5 - 10 min while practicing that's probably perfect.
  - To make sure your ideas flow, explanations make sense, and the pacing is reasonable.
- You can do a practice run with different people.
  - It's a very good idea to do a practice-run with your mentor, as they can suggest better ways to present the material since it's their area of expertise. But it's also a good idea to practice giving it to a friend, especially if they do not know much about the topic, since they can give you feedback on how clearly you convey the new ideas and can probably relate more with a general audience.

## Things to keep in mind when preparing and giving your talk

- Be mindful of your word-choice.
  - Using words like “trivial” or “obvious” might try to convey that it’s not too complicated to arrive at the conclusion, but they can potentially come off as condescending especially if it’s not immediately obvious.
  - Instead, for example, if something is “trivial” because it follows as a straightforward computation, instead state, for example, “by integrating the Gaussian, we see that...”
    - The idea is you should try to state *why* it’s not difficult, instead of just stating it’s “easy” or “clear.”
- You can make the talk interactive!
  - You can ask the audience what they think the next step might be for a proof, or if you introduce a topic which has a common potential pitfall (e.g. something that might be an intuitive conclusion is actually false), you can ask the audience what they think. You could also ask them to make conjectures based on the information you’ve presented so far.
    - It can be a two-way conversation, but be mindful of the time!





## Things to keep in mind when preparing and giving your talk

- Try to be dynamic! 3 hours of math talks can get monotonous: the subjects are for sure fascinating, so you should try to convey your enthusiasm and interest in the topic to the audience. Remember, the human attention span is not long, so try to keep the audience engaged.
  - Try to vary your tone, walk around the room, use hand gestures, and most importantly: *look at the audience*. Don't stare at the slides, or your notes.
    - Read the room: based on people's body language, you can try to gauge if you're going too slow, too fast, if they're confused, etc.
- You can prepare detailed notes and bring them with you, but don't read them (they should just serve as a reference). In a similar vein, do not write a script, memorize it, then present that. Keep it organic; the more you practice your talk, the easier this is.

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## Pedagogical Advice

Some helpful techniques to keep in mind when determining how to present the material.

- Put yourself in the audience's shoes: how did you feel when you just began to learn the material?
  - When deciding how to convey your ideas, ask yourself the following question: what, in a 10 minute-talk, would've helped you:
    - ① Understand everything more quickly?
    - ② Enticed you to learn more?
    - ③ Given you the confidence to continue learning?
    - ④ Helped you understand the bigger picture / how things are connected?
- Speak loudly and clearly, and again make eye contact with your audience. It's ok to ask, "is this clear? Are there any questions?"
- Pictures and diagrams can be a very helpful tool!

Thank you!