

Notes on Effective Mathematics Presentations

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February 17, 2018

We have come a long way since talks were given on chalkboards, or on a stack of transparencies displayed with an overhead projector. But the benefits of electronic presentations with a data projector come with new challenges. Here is some general help that applies to any talk, and some advice on your choice of tools.

1 Preparation

- Think generally about your goals. Ideally, your audience will learn something new, and not be overwhelmed with detail. If they want to learn more, you can provide some knowledgeable direction by listing some resources (books, websites) on your final slide.
- Think about a rough division of your allotted time. Introduction, definitions, examples, results, conclusion. How much time for each?

I know that I design slides with an amount of information that results in me spending about two minutes on each one. I know this from lots of experience. You will have to discover what this rate is for *you*. But once you know it, you can plan your time well even before practicing.

- A simple, but illustrative, example can accomplish a lot. Not too easy, but definitely not complicated.
- Think very carefully about working through a proof in a short talk. It should be simple and elegant, and should somehow illustrate some larger idea. Can you fit it onto a single slide?
- Be cautious about doing a live demonstration assuming an Internet connection, especially in a location you do not know well. Often a screen shot (or a sequence of screen shots) can convey the idea. And you might want screen shots as backup for a bad, or failed, Internet connection.
- **PRACTICE!** You can do this by yourself in a quiet room without disruptions. Speak out loud and you will discover phrasing you need to work on. Time yourself. Record a video. Even better is to enlist a friend or mentor to sit and watch you, and provide suggestions.

- If you use your own laptop, set it so the screensaver does not come on in the middle of a long slide. Disable notifications and automatic software updates. Even better, configure a guest account that is just for presentations, with everything you need, and nothing you don't need. (Do you really want everyone to see that wallpaper with pictures of your family?)
- Put a copy of your talk online, publicly, *before* the presentation. At worst, this can be a fail-safe backup. But some members in your audience might want to follow-up on something immediately. You can always update it afterwards if you discover small errors.
- Be self-reliant. Bring a big-format clock or stopwatch (on your phone). Have the right video connections, especially if you need a special dongle for your Mac. Remember your wireless presenter and laser pointer, and check batteries.
- Arrive early to the room, especially if it is not familiar to you. See what gear is there already—projector, good Internet, microphone, etc..
- If you are using a computer that is already in place, then put your talk on a USB stick and also put it into your webmail. Do not rely exclusively on one or the other.

2 Slides

- *Never* provide an outline. It is a waste of a slide and a waste of your limited time. It serves almost no purpose. Your audience is basically trapped—they will find out soon enough where you are going. Do provide a short introduction, do use good headings on slides, and do include slides that mark major divisions of your talks, which you can click through with a sentence or two of transition. You might use three slides with just big bold titles (alone) to mark off the organization of your presentation:
 1. Title Slide: title, name, affiliation, date, event
 2. A few introductory slides
 3. “Definitions”, followed by a few slides
 4. “Key Example”, followed by a few slides
 5. “Results”, followed by a few slides
 6. A single final slide, with a web address for your talk
- Do not align your slide content to be centered vertically. Until you give invited talks to thousands of people in a huge hotel ballroom, assume sight lines are limited for your audience. (I once gave a conference talk in a hotel room using the

television screen.) So configure your software to push content upwards and strip excess space between bullet points of lists.

A corollary is to not pack so much on a slide that content is crammed down into the bottom. You want slides to be self-contained and topical, but there is also almost zero cost to move onto a new slide. Consider too that the screen may not be very big physically.

- Use lists of bullet points, containing phrases. Even force line breaks at good locations, such as after commas. Do not have long paragraphs on your slides. You are not writing a paper—your slide should be an *adjunct* to what you are saying, not a replacement.
- Color can be very effective, especially in a complicated example, where you can reference various parts: “the black nodes now move to join the red nodes in the blue boxes.”

But *never* use yellow, projectors do very bad things with it. Green can behave poorly, too. Black, blue, and red are best. Brown and purple/pink can be used if you need more. But do not use so many colors that some are very similar, your projector and audience may not be able to distinguish them. Think too about audience members who may be “color blind,” and use shapes as well. “The round black nodes now move to join the red diamond nodes in the square blue boxes.”

Gratuitous color, through relevant images, graphics, or logos, can jazz up your slides, but save this sort of fine-tuning for the end of your preparations.

- Do not put numbers on your slides. And definitely do not put the total number on each slide! It will make your audience anxious to get to the end. And the total can be deceiving if you like to use overlays. Nobody wants to think you are going to rush through 87 slides in 15 minutes.

Do have a rough idea of timing. Suppose you have 15 minutes for the slides above. Four major divisions, so three minutes each. One minute each for introduction and final wrap-up. One minute left over for a *single* question. Check this against the clock as you go, and if it is more complicated, have paper notes that layout the timing (in big bold text).

- Co-authors and collaborators go on the first slide, everybody else (helpers, mentors, grant agencies) go on the final slide.
- Stay away from PowerPoint, or similar software not designed to accomodate the special needs of mathematics. Especially if you are presenting on somebody else’s computer, since the fonts you need and want may not be installed. For a talk that is at all technical, this suggests a PDF built with \LaTeX and Beamer. That is your safest choice.

I really like the Beamer Metropolis theme, but then so does everybody else, so it is already a bit cliched. Be sure to use the presumed fonts, and really be sure to check out the `progressbar` option. Sneaky.

3 Delivery

- **LOOK** at your audience. **NEVER** read your talk off of the screen. Position yourself, and the computer screen, so that you can see the screen well enough to remind yourself what the current slide is about, and most importantly, look straight at the audience. And also, do not stand in the way of the audience's view of the screen. Sometimes, but definitely infrequently, you will want to point to the screen (with your hand, a stick, or a laser pointer) to point out key features of a graph or complicated table of data. Infrequently.

Your audience can read, and you want to read their faces, so speak to them *about* the slides. If you are nervous (perfectly natural), locate the smiling person who keeps nodding, and keep checking in with them.

If you have a long verbatim quote, let the audience read it themselves. Read it to yourself silently to time when to resume (they will lag behind you a bit).

The above would all imply that using a laser pointer to point at text as you read it off the screen would be about the worst thing you could do!

- A good wireless presenter is a very wise investment. You can roam around, stand at an optimal location (see above), and you do not need to stay tethered to the computer's space bar. Hold it in your weak hand, and do not zap the screen or projector with it. Watch the evening news on television to see how the weather is presented. See if you can locate their clicker. This will help with the point just above, and is the easiest thing you can do to improve all of your presentations.

Remember to turn it off when done, and remember to collect the USB receiver if the computer is not yours. And check the batteries before you travel to the venue, you may have forgotten to turn it off last time.

- Most wireless presenters have built in laser pointers. Usually they are not very good. If you are going to rely on a laser pointer, invest in a powerful one, likely a green laser costing around \$40.
- Start with a joke, or something witty and/or with a local flavor if you are visiting somewhere. It will give you a jolt of confidence. Along with a jolt of espresso, you'll be fine.
- There is a risk of going too fast and finishing early (usually due to nerves) and a risk of going too slow, and not finishing or rushing (usually due to poor preparation).

Keep a close eye on your time (see above). Speed up or slow down accordingly.

Another great place for advice on presentations is the collection of good vs. bad videos at Denison University's [Technically Speaking](http://techspeaking.denison.edu/Technically_Speaking/) site at

techspeaking.denison.edu/Technically_Speaking/

But most all, try to enjoy yourself. You have a captive audience, and you are speaking about a topic you know well, and you know it better than most of your audience. So enjoy the opportunity to take the stage!