Elements of Effective Oral Presentations

ATM 620 Climate Journal Club
January 23, 2009, 3:30-4:40, IARC 319
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Main Points

- What 1-2 science points do you want people to remember? Tell them at the beginning, tell them in the middle and tell them again at end.
- Prepare your slides carefully & rehearse until it looks unrehearsed.

References

- Jim Callen's handout, UWisc professor
- Oceanography Society primer
  [http://www.tos.org/resources/publications/sci_speaking.html]
- E. Tufte books (bit pompous but useful)

Outline

- Part I Overview of process of making a talk
- Part II More details about producing your visuals

Giving Effective Talks Is Important

- **Your Important Results Should Be Communicated To The Scientific Community**

  If results are not important, why is talk/poster being given?

- **Your Professional Reputation Will Depend In Large Part On How Well You Communicate Your Key Results**

  If your colleagues cannot understand your work, they will have little appreciation of it or your contributions to it

- **Competing Ideas Are Often Forcefully Presented**

  Major laboratories have presentation courses, talk rehearsals, etc. to hone their talks

Basics

- ASSUME: Familiarity with subject, confidence in your research, some interesting content to share
- First Steps:
  - What is my audience? Taylor talk to fit.
  - How long? Get details if invited talk.
  - What is my hook? (Presentation Thesis)

Part I

To Determine Content

- Primary purpose is to teach the audience, secondary is to persuade...
- Topic determined by session or abstract submitted
- Depth and Scope by audience and time allotted (e.g. AMS/AGU 15 minute talks or ATM seminar)

Part I

Things to think about

- Why does anyone care about what I am doing other than me?
- What relevance is this in the big picture?

This need only be one sentence or idea in your motivation/background slide, but should be repeated.

Part I

Talk Organization

- Introduction (1-3 slides)
  - Title slide, motivation, background
- Body
  - Results
- Conclusions (1 slide)
  - Repeat main points
- **One minute per slide is reasonable**

To Develop Content

- Be clear and concise
- Do not cover too much material in little depth or too fast. Better to cover a few points in depth.
- Equations, use sparingly and explain throughly. Augment understanding with handouts.
- Use well prepared graphics and use words to explain clearly what the plots mean.

Part I

Draft Talk

- Use slides to guide your talk.

  1. Write out entire talk, practice OR
  2. Outline talk, practice

- Put extra information in the notes section of your talk software (do not be stupid like me!)
- Example of what I do... What do others do?

Part I

Drafting Talk cont..

- Good structure, make every word count
- Use simple, directive, active words
- Avoid too much jargon, tighten sentences, & simplify phrases. Use short sentences when possible.
- Develop good transitions between slides/ thoughts

Part I

Time

- NEVER EVER EVER run overtime

- Keep track of time & go to your summary slide when you have one minute left.

Part I

Practice

- Rehearse out loud so many times that the talk seems natural and not memorized.
- Rehearse enough so that you stay within the allocated time and so that you feel relaxed going through the slides
- Tape record talk and listen to it. Videotape talk and evaluate it. (read notes)
- Practice with visual aids which includes movements

Part I

Pre-talk information

- Check out the room where you will give the talk at least the day before if possible
- Attend talks in the room you are speaking if possible
- Adjust talk according to items above
- Introduce yourself to session chair so he/she knows you are there.
- Upload your talk early enough and review it.

Part I

Dress

- Err on the conservative side. Better to wear bland unnoticeable clothes then a crop top, blue wig & spiked heals. You want them to remember your talk not be distracted by your clothes. Look neat and err on side of being too formal.

Visual Aids

- Read history on pg. 11 of 'Scientifically Speaking'
- 10 Commandments - go over
  - Title of each slide
- Tufte comments (pg 19)

Part II

Effective Visuals Have 5 Components

(outline of topics covered in most of remainder of this talk)

- **A Title That Is A Thesis**

  What is to be learned from this visual?

- **No More Than Six Major Points**

  More will seldom be absorbed by audience

- **Large, Clearly Readable Lettering Separated By Adequate Spacing**

  Key points should be obvious, not buried

- **Self-Explanatory Major Elements**

  Audience should be able to grasp major points without verbal explanation

- **Maximum Use Of Graphs Or Pictorials**

  "A picture is worth 1000 words"

Part II

Too Much Information On A Visual Tends To Obscure The Basic Message Which Is Being Presented On A Visual

- Most People Do Not Absorb More Than Six Facts From Any One Visual
- Putting More Facts On Any One Visual Tends To Confuse The Basic Message
- It Is Difficult To Compress A Lot Of Information Onto One Visual
- It Is Better to Limit The Amount Of Information On A Visual To Only The Critically Important Issues
- By Putting Too Many Points On One Visual, One Tends To Confuse Trivial Points With Important Ones
- One Should Decide Which Are The Important Facts Germane To The Thesis Of The Visual And Limit The Visual To Those Facts
- Major Facts Can Be Amplified By Subfacts

  Subfacts can be indicated by a different typeset or capitalization
- If Too Many Facts Are Presented On A Visual The Audience's Long Term Memory May Be Dominated By A Trivial Fact
- The Various Facts On A Visual Should Be Presented Hierarchally With The Major Facts Obviously Dominant And The Minor Ones Subordinate
- Ample Space Should Be Left Between Separate Points So They Don't Become Blurred Together
- Major Points Should Be Explained In As Simple And Clear A Form As Possible

Example of a bad visual—far too much stuff on one visual

Part II

Visuals Should Be Very Readable

- **Use Large, Clearly Readable Lettering**

  Maximum should be about 10 lines of up to 30 letters per line

- **Provide Adequate Spacing Between Major Elements**

  Otherwise points get blurred visually and conceptually

- **Make Key Points Obvious Visually**

  Subordinate points should be indented, have smaller letters, not be capitalized, etc.

- **Present Major Elements Clearly**

  Use simple statements, formulas, graphs, etc. and only those necessary to elucidate the key points

Part II

Major Elements Of Visuals Should Be Self-Explanatory

- **Material Is More Understandable If Audience Can Independently Comprehend The Major Elements**

  Talk structure should reflect logic of critical scientific elements and their interrelationships

- **Message Should Be Apparent Without Speaker's Verbal Presentation**

  Key points of talk should be apparent from visuals themselves

  People don't always listen carefully to what the speaker says

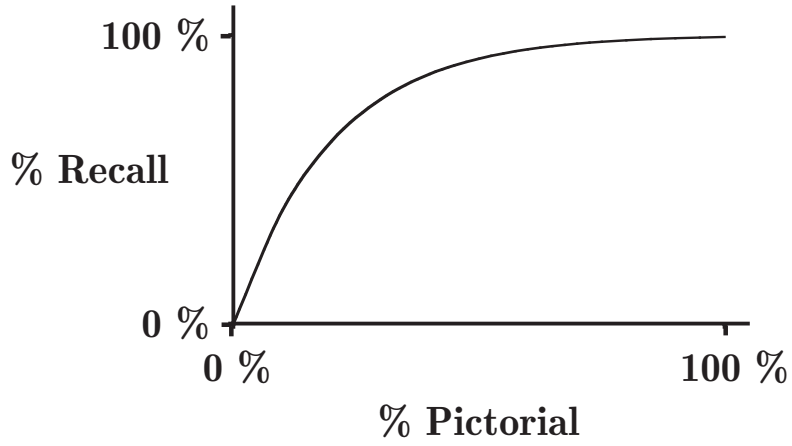
- **Audience Tends To Read Past Speaker's Present Point In Presentation**

  Did you read this before I said it?

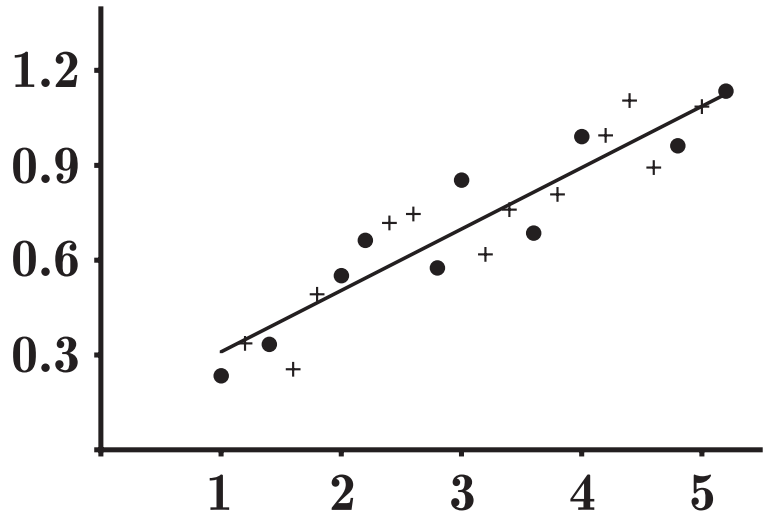
Part II

Develop Analog Graphics For Many Of Your Visuals

- **Audience Recall Of Analog Graphics (Curves, Sketches, Graphs, Bar Charts, etc.) Seems To Be Unlimited**
- **Reinforcement Of Facts And Ideas By Use Of Pictorials Improves Audience Recall By A Factor Of 10**
- **Analog Graphics Improves Retention Of Facts And Ideas Over Use Of Statements And Equations**



Part II

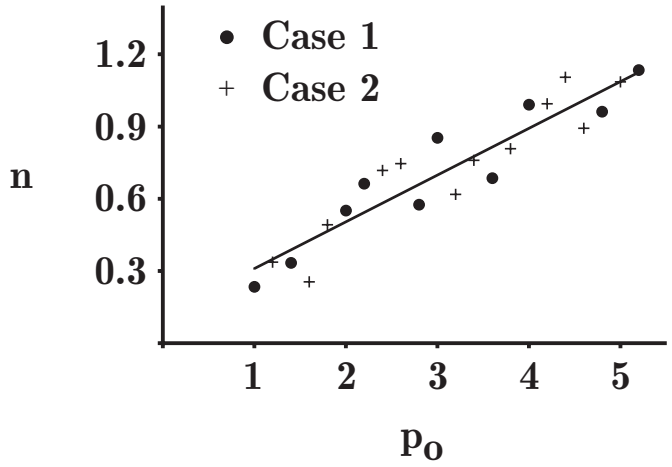


Terrible Experimental Data Illustration

No title, no labels, no indication of what the data represent or why there is a line on the graph

How is viewer supposed to figure out what the speaker wants to convey? Part II

Graph of n Versus p_o



Poor Experimental Data Illustration

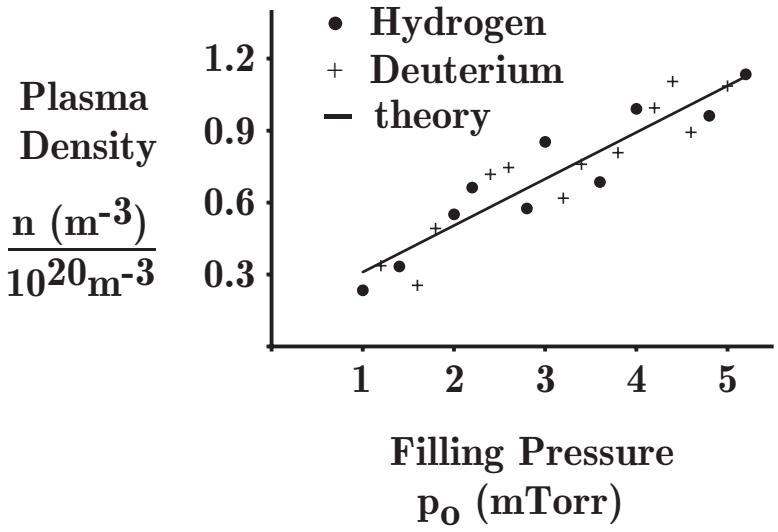
Title is only a label, not thesis of visual — it only tells us "this is a graph"

Labeling is not helpful — case 1, 2?, what are n, p_o?

Not clear what message of this graph is — the author can plot points near a line on n vs. p_o graph?

Part II

Plasma Density Increases Linearly With Filling Pressure



Better Experimental Data Illustration

Simple declarative title with action verb that is thesis of graph

Axes and points are labeled physically and understandably

Graph supports declarative title — no more or less information than necessary

Part II

$$DKE: \frac{\partial f}{\partial t} + v_\parallel \underline{n}\cdot\nabla f + \underline{V}_D\cdot\nabla f = C(f)$$

$$v_\parallel \underline{n}\cdot\nabla f = v_\parallel(\underline{n}_0\cdot\nabla + \frac{\underline{\tilde{B}}}{B}\cdot\nabla)f = v_\parallel\frac{\partial f}{\partial s} + \frac{\tilde{b}}{B}\cdot\nabla f$$

$$\frac{\partial f}{\partial t} + \underbrace{v_\parallel\frac{\partial f}{\partial s}}_{\sim\omega_b} + \underbrace{v_\parallel\frac{\underline{\tilde{B}}}{B}\cdot\nabla f}_{\sim\omega_D} + \underbrace{\underline{V}_D\cdot\nabla f}_{\sim\omega_D} = \underbrace{C(f)}_{\sim\nu}$$

$$\epsilon \sim \frac{\nu,\omega_D}{\omega_b} << 1,\ f = f_0 + \epsilon f_1 + \cdots$$

$$\epsilon^0: \frac{\partial f_0}{\partial s} = 0$$

$$\epsilon^1: \frac{\partial f_0}{\partial t} + \frac{m}{e\tau}\left[\frac{\partial J}{\partial\beta}^{**}\frac{\partial f_0}{\partial\alpha} - \frac{\partial J}{\partial\alpha}^{**}\frac{\partial f_0}{\partial\beta}\right] = \langle C(f_0)\rangle$$

$$\langle A\rangle \equiv \frac{\oint ds/v_\parallel A}{\oint ds/v_\parallel},\ J^{**} = \oint d\underline{s}\cdot\left[\underline{v}_\parallel + \frac{e}{mc}\underline{\tilde{A}}\right]$$

Mirror-trapped particles: $J^{**} = \oint ds v_\parallel = J(\alpha,\beta,E,\mu)$

$$\delta \sim \nu/\omega_D << 1,\ f_0 = f_0^0 + \delta f_0^1 + \cdots$$

$$\delta^0: \frac{\partial J}{\partial\beta}\frac{\partial f_0^0}{\partial\alpha} - \frac{\alpha J}{\partial\alpha}\frac{\partial f_0^0}{\partial\beta} = 0 \Rightarrow f_0^0 = f_0^0(E,\mu,J) + g(E,\mu)$$

$$\delta^1: \frac{m}{e\tau}\left[\frac{\partial J}{\alpha\beta}\frac{\partial f_0^1}{\partial\alpha} - \frac{\partial J}{\partial\alpha}\frac{\partial f_0^1}{\partial\beta}\right] = \left\langle C(f_0^0)\right\rangle$$

Toroidally-passing particles: $J^{**} = \oint d\underline{s}\cdot\left[\underline{v}_\parallel + \frac{e}{mc}\underline{\tilde{e}}\right] = J + \frac{e}{mc}\tilde{\psi}$

$$\delta \sim \omega_{Dp}/\nu << 1,\ f_0 = f_0^0 + \delta f_0^1 + \cdots$$

$$\delta^0: \left\langle C(f_0^0)\right\rangle = 0 \Rightarrow f_0^0 = f_{Max}(E,\alpha,\beta)$$

$$\delta^1: \frac{m}{e\tau}\left[\frac{\partial J}{\partial\beta}^{**}\frac{\partial f_0^0}{\partial\alpha} - \frac{\partial J}{\partial\alpha}^{**}\frac{\partial f_0^1}{\partial\beta}\right] = \left\langle C(f_0^1)\right\rangle$$

Density Conservation Equation:

$$\frac{\partial}{\partial t}\oint\frac{ds}{B}\frac{2\pi}{m^2}\sum_\sigma\int\frac{dEd\mu B}{|v_\parallel|}f + \oint\frac{ds}{B}\frac{2\pi}{m^2}\sum_\sigma\int\frac{dEd\mu B}{|v_\parallel|}\left[v_\parallel\frac{\underline{\tilde{B}}\cdot\nabla f}{B} + \underline{V}_D\cdot\nabla f\right] = 0$$

$$\text{or, } \frac{\partial n(\alpha,\beta,t)}{\partial t} + \frac{2\pi}{m^2}\sum_\sigma\int dEd\mu\frac{m}{e}\left[\frac{\partial J}{\partial\beta}^{**}\frac{\partial f_0}{\partial\alpha} - \frac{\partial J}{\partial\alpha}^{**}\frac{\partial f_0}{\partial\beta}\right] = 0$$

$$\text{or, } \frac{\partial n(\alpha,\beta,t)}{\partial t} + \frac{1}{\oint ds/B}\left\{\frac{\partial}{\partial\alpha}\frac{2\pi}{m^2}\sum_\alpha\int dEd\mu\frac{m}{e}\frac{\partial J}{\partial\beta}^{**}f_0 - \frac{\partial}{\partial\beta}\frac{2\pi}{m^2}\sum_\sigma\int dEd\mu\frac{m}{e}\frac{\partial J}{\partial\alpha}^{**}f_0\right.$$

$$\left. + \frac{2\pi}{m^2}\sum_\sigma\int dEd\mu\frac{m}{e}f_0\left[\frac{\partial^2 J^{**}}{\partial\alpha\partial\beta} - \frac{\partial^2 J^{**}}{\partial\beta\partial\alpha}\right] = 0\right.$$

$$\text{i.e., } \frac{\partial n(\alpha,\beta,t)}{\partial t} + \frac{1}{\oint ds/B}\left[\frac{\partial\Gamma_\alpha}{\partial\alpha} + \frac{\partial\Gamma_\beta}{\partial\beta}\right] = 0$$

Bad Theory Visual — no thesis title, too much information that is not well labeled or clearly explained

Part II

EBT Neoclassical Transport Theory For Field Error Effects Done With Multiple-Time-Scale Expansions

- **Beginning Point Is Gyrophase-Averaged "Drift-Kinetic" Equation**

$$\frac{\partial f}{\partial t} + \underbrace{v_{\parallel}\underline{n}\cdot\nabla f}_{\substack{\text{parallel motion} \\ \text{("bounce" motion)}}} + \underbrace{\underline{v}_D\cdot\nabla f}_{\substack{\text{drift} \\ \text{motion}}} = \underbrace{C(f)}_{\text{collisions}} \quad , \quad \underbrace{\underline{n} \equiv \underline{B}/B}_{\substack{\text{unit vector} \\ \text{along } \underline{B}}}$$

- **Magnetic Field Unit Vector Is Split Into "Perfect" And "Field Error" Parts**

$$\underline{n} = \frac{\underline{B}}{B} = \underbrace{\frac{\underline{B}_0 + \widetilde{\underline{B}}}{B}}_{\substack{\text{"perfect"} \\ \text{closed field line} \\ \text{magnetic field}}} \simeq \underbrace{\frac{\underline{B}_0}{B_0} + \frac{\widetilde{\underline{B}}}{B_0}}_{\text{"field error"}} = \underline{n}_0 + \frac{\widetilde{\underline{B}}}{B_0}$$

- **Various Frequency Scales Emerge From Drift-Kinetic Equation**

$$\frac{\partial f}{\partial t} + \underbrace{v_{\parallel}\frac{\partial f}{\partial s}}_{\sim\omega_b f} + \underbrace{v_{\parallel}\frac{\widetilde{\underline{B}}}{B}\cdot\nabla f}_{\sim\omega_D f} + \underbrace{\underline{v}_D\cdot\nabla f}_{\sim\omega_D f} = \underbrace{C(f)}_{\sim\nu f}$$

frequencies: bounce; drift; drift; collision

Part II

Better Theory Visual — thesis at top, steps explained and reasonably spaced

Delivery

- Practice until your voice sounds pleasant
- Make eye contact
- Look relaxed (practice enough)
- Avoid monotone
- Stand carefully (watch posture)

Part II

Questions & Answers

- In 2 weeks get a whole presentation on this.
- Listen to question carefully before answering
- Don't get defensive not matter what
- Answer to best of ability

Summary

- Giving good science talks is important for your professional reputation
- Key elements of a good talk: consider audience to choose level, have clear thesis (hook), prepare visuals to support thesis, summarize, & rehearse
- Teach your audience something new and they will be happy customers
- Be clear can precise in what you say, don't over or undersell your work
- Have fun & be relaxed