

## Poster Design and tips

Vision Modelling Lab

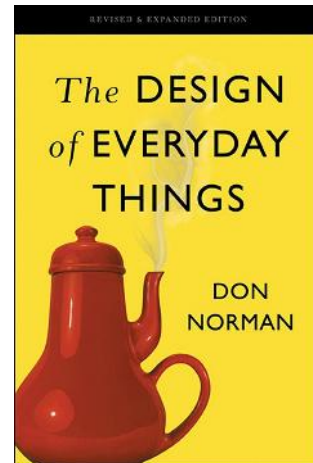
Joseph MacInnes

7/21/2019

## Usability design is a science

- Human factors engineering
- Usability
- Human computer interaction
- Cognitive ergonomics
- All the way back to Xerox Parc, millions of dollars are spent by industry in these research areas
  - Apple stole from Xerox, microsoft stole from Apple

- Edward Tufte
- *Visual Display of Quantitative Information* 200 pages
- *Envisioning Information* 128 pages
- *Visual Explanations* 160 pages
- *Beautiful Evidence* 214 pages



## Fonts

- 400,000 scholar articles on human factors of fonts alone

## Visualization

- More than just showing data
  - Data graphics vs information visualization
  - Points, lines, one or more coordinate system, numbers, symbols, words, shading and colour
  - Allows *reasoning* about data
- Important part of the story you are trying to tell
  - Or a small story in itself
  - More than just a substitute for small statistical table
- Mathematics goes back thousands of years
  - But visualization barely 200
  - William Playfair (1759-1823)
- Statistic, words and visualizations are your three key tools for telling your story
- Reference: Many images from : Edward Tufte. *The visual display of quantitative information*.

## Golden rule

- Precision in writing?
- Most information in the fewest words
- Precision in visualization?
- Most information with the least ink
  
- Golden rule 'Don't let the visualization get in the way of understanding the data'

## Principles

- Show the data
- Allow the viewer to think about substance or essence of data
- Avoid distorting what the data have to say
- Present many numbers in a small space
- Make large data sets easy to understand
- Encourage the eye to compare different pieces of data
- Show the data at multiple levels at the same time (detailed and overview)
- Have a clear purpose
  - Description
  - Decoration
    - Not always least ink, but beware of ducks
  - Exploration
- Be closely aligned to the statistic and verbal descriptions

## In detail: “Studies on the facets of face recognition”

- “The effect of <some manipulation> face recognition”
- “The effect of <some manipulation> on <which facets> of face recognition”.
- “<some manipulation> on <particular facets> of face recognition cause <some effect/result>”
  - This may be too much.
  - Normally, I would stick to the most important; the manipulation, the area (face recognition) and the result.
  - You could stick with the second if hiding the result was important
- “Changing viewer angle in a face recognition task removes the same-race bias”

## Ducks (AKA Chart-junk)



## Visual diagnostics

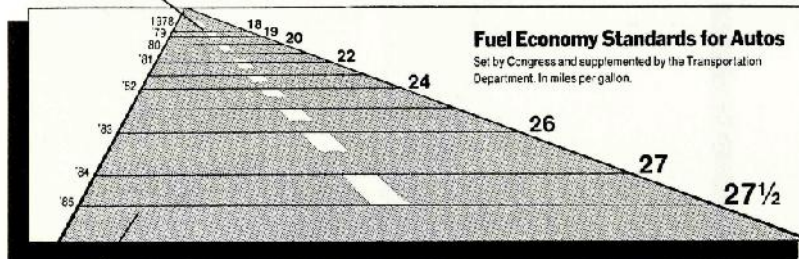
- Cholera outbreak, London, 1854
- Dr John Snow plotted a dot for address of each death, and a cross for location of water pumps
- After creating this visual, he removed the handle from the pump at Broad street (circled) and ended the epidemic that killed 500 people in that neighbourhood



## Lie factor

- Lie factor = size of effect in graphic/size of effect in data
- Graph lines increase 758%, data increases 53%
  - $783/53 = 14.8$
- Other problems
  - The future is usually depicted as 'ahead' of us, but this graph reverses that standard to help the exaggeration
  - Dates on the left maintain the same font size despite the perspective that changes everything else
  - Line size is shrinking from both perspective and smaller data numbers. The viewer cannot separate these two effects

This line, representing 18 miles per gallon in 1978, is 6.6 inches long.



This line, representing 27.5 miles per gallon in 1985, is 5.3 inches long.

## Principles

1. Representation of numbers, as measured by graph surface, should be proportional to the real data
2. Graphs require clear and detailed labelling, including key events
3. Show data variation, not design variation
4. Ensure your data only display a single influence. Use standardized units if the data change over time due to causes other than your primary effect
5. Don't use more dimensions in the graph than in the data
6. Do not quote data out of context

## Repetitive ink

- Some redundancy in graphics is good, but too much is wasted ink
  - A basic bar chart repeats height information in six different ways
  - Eliminate any 5 and you still get the point across

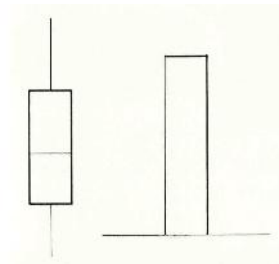


Value/magnitude is portrayed by

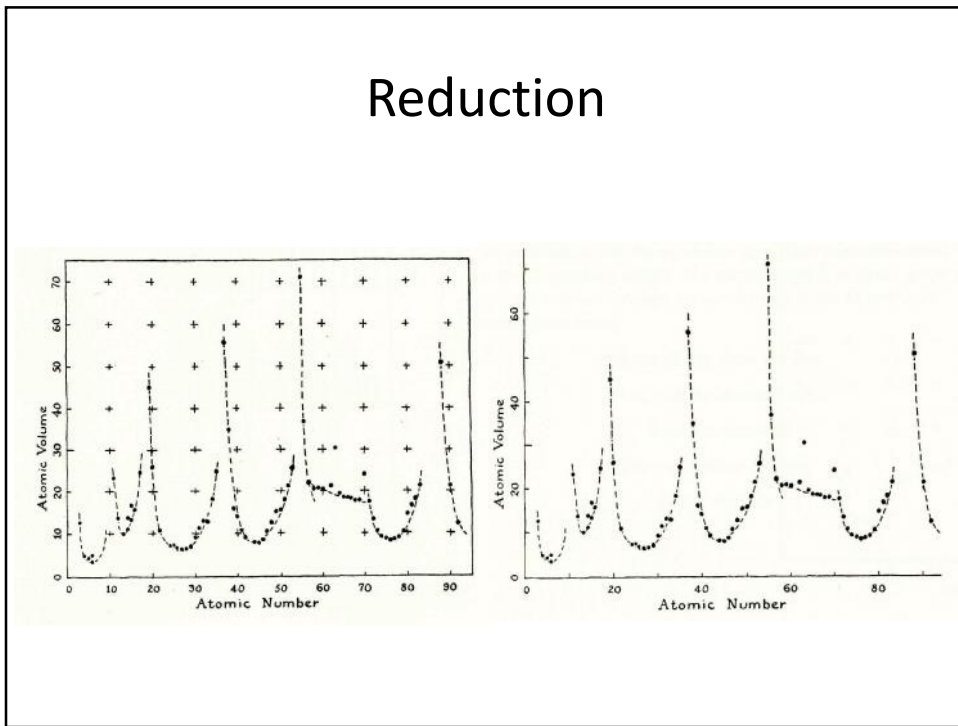
1. Height of left line
2. Height of right line
3. Height of shaded area
4. Position of top horizontal line
5. The number itself
6. The location of the number

## Remove ink or add data

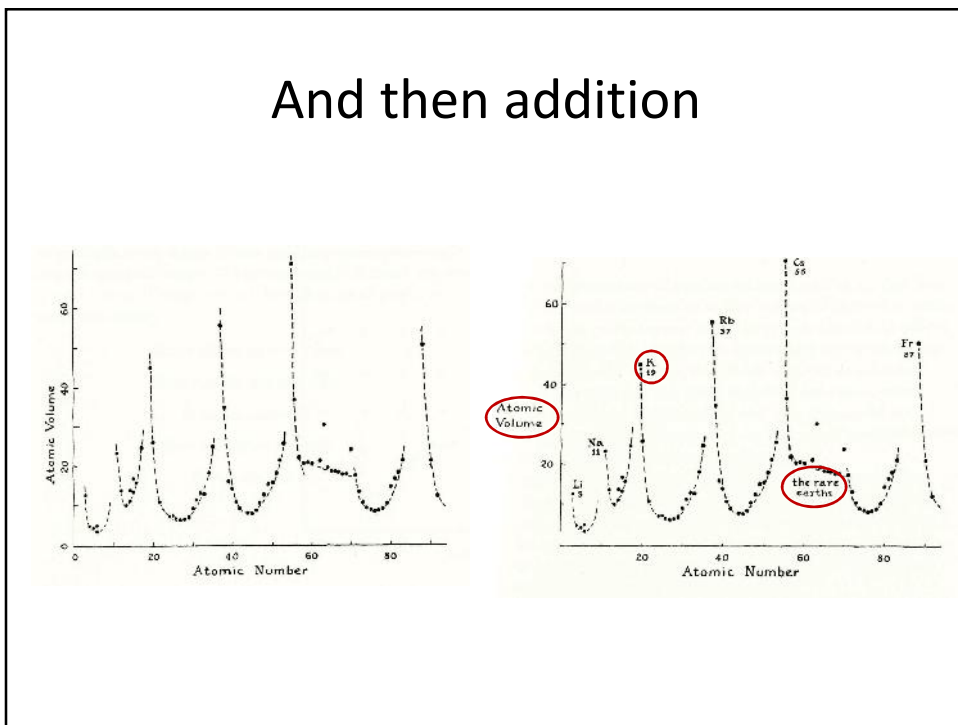
- Box plot vs bar chart
- Same ink and both portray mean
  - but box plot adds variance and 90%/10% confidence intervals



## Reduction



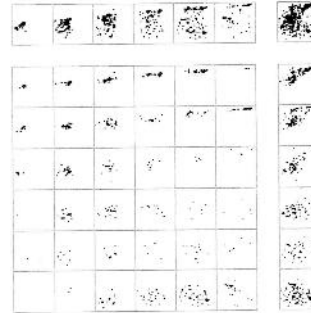
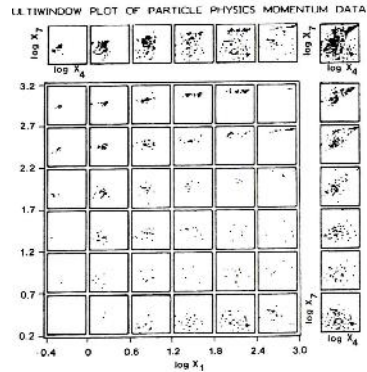
## And then addition





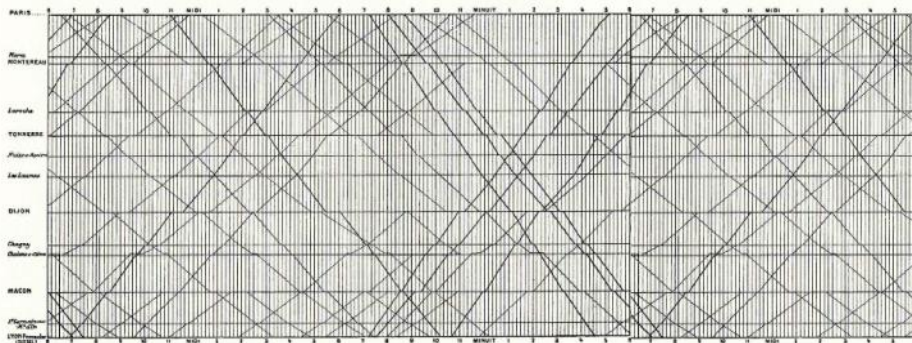
## Darkness

- Light grey and muted colour is your new best friend



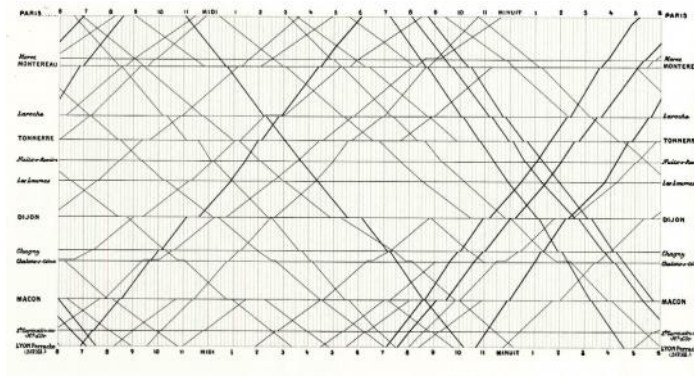
## Good redundancy

- Repeating part of the day in the French train example
  - Travellers don't have to find their line on the left after it disappears on the right
  - Or a clever designer could mount this on a cylinder instead!



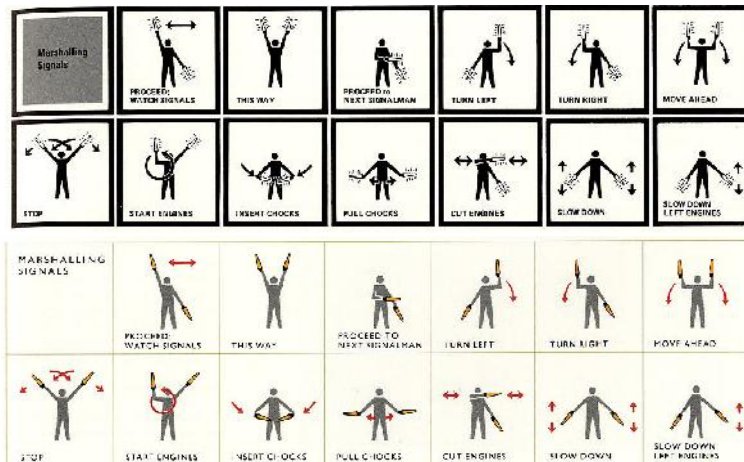
# Thin grey

- Remember our train schedule?



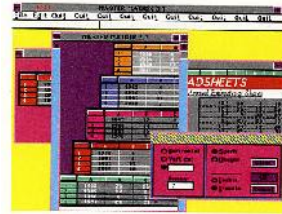
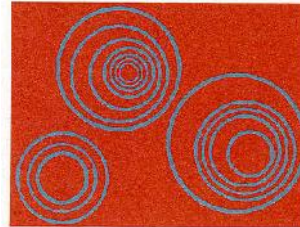
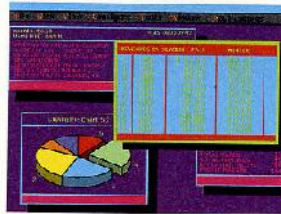
# Colour : other

- Be VERY conservative using colour
- Small amounts of intense, saturated colour can draw attention to key aspects
  - Motion, significant results
  - Too much colour will attract attention everywhere



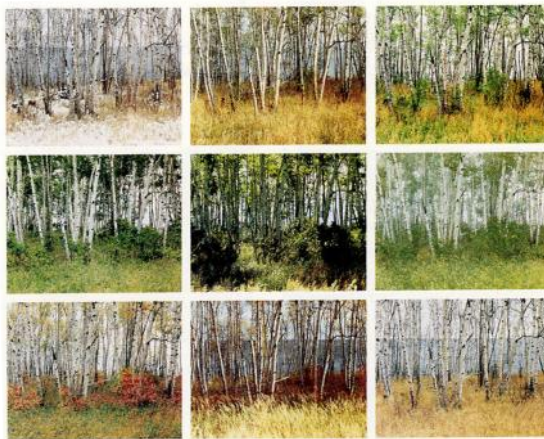
## Colour excess

- Avoid colour for colour's sake
- Blue and red in particular do not mix



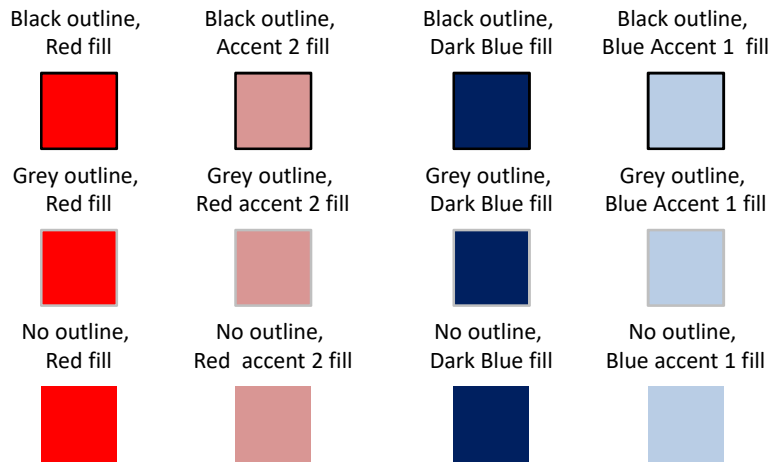
## Colour palette

- If you want to group colours, look to nature



## Colour palette

- And 'accent' colours in Powerpoint
- Colour is extremely potent in grabbing attention
  - Be subtle



## Graph layouts

- Use the 2-page view option in word to get overview of document
- We will cover more of this in Posters



## Powerpoint

- Used to design posters and presentations
- Great for storing notes
- Organizing ideas when starting to write
- But what about presentations themselves?

## Cognitive style

- The software tool doesn't determine how good the content of the presentation is, does it?
  - Yes
- Powerpoint has a cognitive style that influences the way you think about your presentation
  - And these styles may influence poster designs

## Power point marketing

- 'A cure for the presentation jitters'
- 'Get yourself organized'
- 'use the content wizard to figure out what you want to say'
  
- Who are these aimed at?

## Who is power point for?

- Presenter focused
- Not Audience focused
- Nor content focused

## Presenter focused

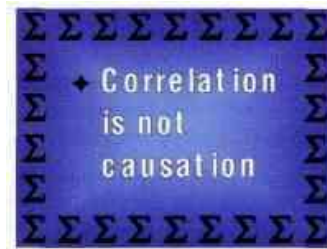
- Memory aid
  - Don't forget points in a long talk (or class!)
- Storage aid
  - Maintain an outline of the talk for others

## 'Some' Audience focus

- Multimodal
  - Sounds, words, graphs
  - Reading can be easier than speech for non native speakers

## Resolution

- Projectors have limited screen space and 800x600 pixels resolution
  - This can result in too much cutting
- Reduction is good, but not if we cut important parts of the message
  - We want precision not brevity



These slide leaves out the small detail that correlation is necessary for causation, but not sufficient

## Resolution (2)

- So each slide has minimal space and Powerpoint solves this with linear time
- Add more slides to the sequence to expand on the story
- But memory and reasoning work better when information is available in adjacent space
- Statistic and scientific data in particular require us to make comparisons



## Bullet outlines

- Bullet phrases are compressed language
- But do we really need help understanding when a phrase begins?
  - Language already has many helpful punctuation marks
- Powerpoint also provides explicit orderly structure
  - But only linear structure
  - No possibility for relational structure

- Increase market share by 25%.
- Increase profits by 30%.
- Increase new-product introductions to ten a year.

What is the relationship here?  
Causal? Circular?

## Heirarchy Level 1 Title of Slide

- Level 2 • Very Big Bullet
    - Level 3 — dash
      - Level 4 • little bullet
        - Level 5 —little dash
          - » Level 6 >> arrows ending level 5
- What does this progression imply?

(depth) General to specific?

(Font) Important to less important

### Review of Test Data Indicates Conservatism for Tile Penetration

- The existing SOFI on tile test data used to create Crater was reviewed along with STS-87 Southwest Research data
  - Crater overpredicted penetration of tile coating significantly
    - Initial penetration to described by normal velocity
      - Varies with volume/mass of projectile (e.g., 200ft/sec for 3cu. In)
    - Significant energy is required for the softer SOFI particle to penetrate the relatively hard tile coating
      - Test results do show that it is possible at sufficient mass and velocity
    - Conversely, once tile is penetrated SOFI can cause significant damage
      - Minor variations in total energy (above penetration level) can cause significant tile damage
  - Flight condition is significantly outside of test database
    - Volume of ramp is 1920cu in vs 3 cu in for test



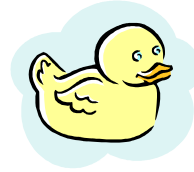
### Unable to Predict Damage to Columbia

- The Crater software used to predict tile damage was calibrated using a foam hit 600 times smaller than the foam that hit Columbia on lift-off.
  - 1920 in<sup>3</sup> vs. 3 in<sup>3</sup> for test.
  - Therefore, as a predictor, Crater is useless in this case.
  - Nonetheless, it should be noted that even the tiny foam particles used to calibrate Crater can penetrate the tiles when they strike with sufficient velocity.
  - Once tiles are penetrated, significant damage to the spacecraft is possible.
- We recommend immediate visual inspection of the wing to assess damage.



## Powerpoint animations

- Information
- Provided
- One line
- At a time
- To build suspense
- Where none exists



## Tips

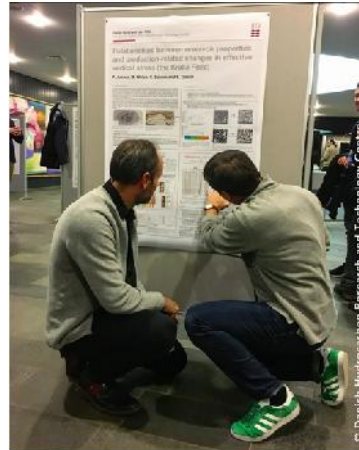
- Stick to key points and repeat
- Don't abuse hierarchy
- Provide an overview
- Let listeners know where they are in the talk
- Minimal colour

## Make it about the audience

- Powerpoint is about making things easier for the presenter
- Turn that around and make it about the audience, and the content
- The audience begins the presentation asking these questions
  - What is the presentation really about
  - Why is it important
  - What is the structure of the presentation
  - Will they understand the presentation
- Give them this information early on

## Posters

- Vertical (portrait layout) posters need to stop
- Our reading field of view is horizontal
- Puts too much outside Usable field of vision
- If you have to, put important stuff at eye level



## Title

- Inform and attract
- The title should
  - Identify the field of study
    - Both general (psychology) and specific (episodic memory)
  - Separate your document from all other documents in the field
    - At least the most distinct part of the research

# From ECP

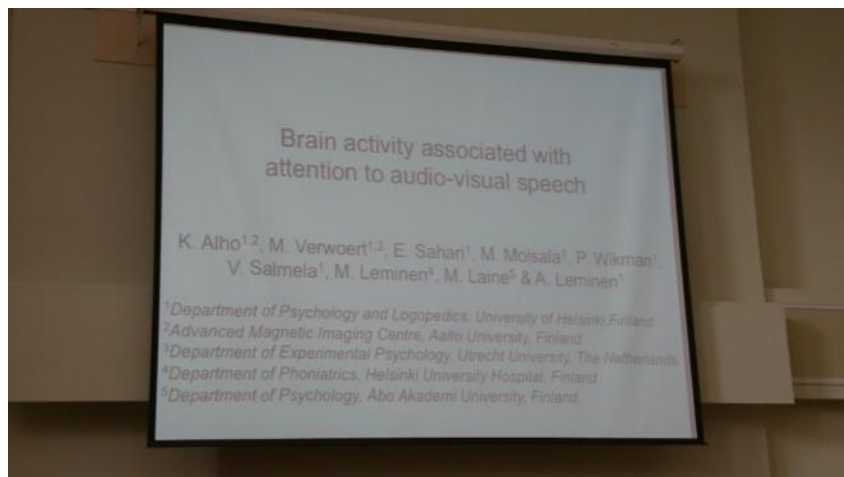
- Bad examples are too numerous to list



## Reverse contrast in bright light

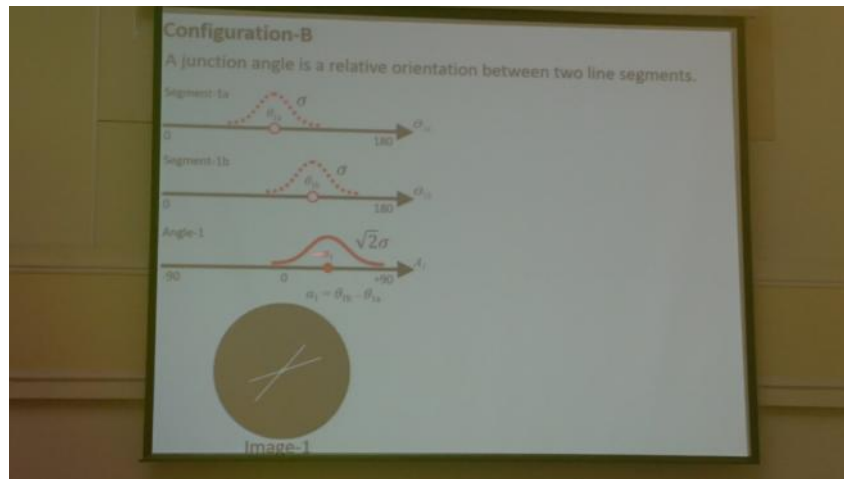


## Normal contrast in same light



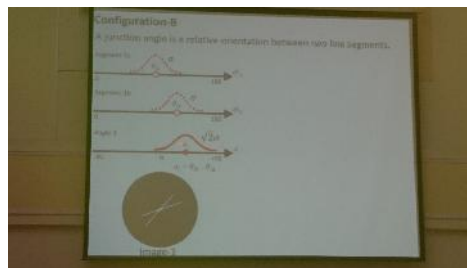


## Our very own Tada



## Our very own Tada

- Minimal use of colour
- Only to highlight and group
- High contrast, white background, thick lines
- Excellent use of whitespace focuses attention on important information
- Text message is all in 'priority' position



I don't know where to start



- How to create a better research poster in less time (including templates)
  - Youtube video
- The ideas are often good
- The implementations are among the worst I've seen
- Even the video fails to implement the ideas
- 10+ minutes into the video, they still hadn't introduced their main message!!!!

## Incorrect advice from video

- Focus on the main message
  - This assumes there is only one
  - The main result is supposed to be in your title anyway!!
- Reverse contrast
  - See examples from ECP.
- Minimize title and author
  - Many senior researchers have looked at the list and are searching for your title!
  - Or they know your name (or supervisor) and looking for that
- Large scan code
  - They have their phone out to take a pic of your poster
  - The scan code adds an extra step
- Assumes the poster is the primary source of information
  - NO! It's you, the presenter
  - The only advantage of posters is that they are interactive

## Example of beautiful poster

- Yes, beautiful, but its also a duck
- Good focus on graphics
- Horrible use of white space and overwhelms attention
- This is called a 'straw man'

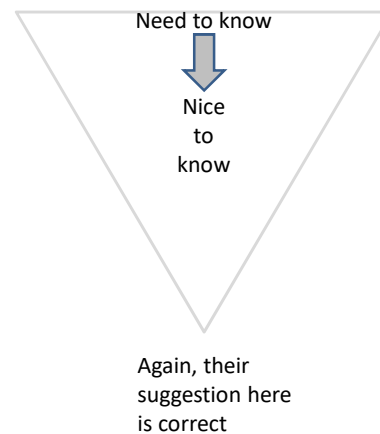


## More incorrect advice

1. Maximize insight
  1. Every poster in 50 minutes? No.
2. Keep the good stuff
  1. Interaction, yes of course
3. Make it easy for lazy students to make
  1. No. This is work, and worth the effort
  2. It is the MAIN WAY YOUR EARLY CONTRIBUTION WILL BE EVALUATED

## Partially correct advice from video

- “Perfection is not when you have nothing to add.
- It’s when you have nothing to take away”
- This is similar to Tufte’s “Maximum information, minimum ink”
- But in reality perfection is BOTH





## Plain language suggestion

- Plain language is less precise
- Not needed because these are EXPERTS
- Concise! Not Simple

For **international students**, **perseverance** and a sense of **social responsibility** are extra important for predicting first-year **GPA**.

## 'Proper' poster

**Non-Cognitive Predictors of Student Success: A Predictive Validity Comparison Between Domestic and International Students**

Dr. Alan Lewis, Larin T. Lee, Rose Mullins, Dr. Kristin Williams

**INTRO**

- Increasing interest in utilizing non-cognitive predictors in the college admission process
- Wider involvement of international students

**METHODS**

- We compare the predictive validity of these measures across domestic and international students
- Results indicate lower predictive validity differences do exist and an explanation for this differential validity, as well as a reduction of these relationships, are noted.


**RESULTS**

- Contrast differential validity for some non-cognitive measures for international students, specifically for SET, Continuous Learning, Social Responsibility, and Perseverance
- Differential validity for international students does not seem to be the result of functioning as a proxy for English language ability
- Cultural distance does not seem to mediate validity of non-cognitive

**DISCUSSION**

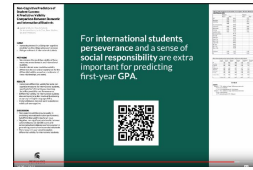
- Non-cognitive abilities may be useful in predicting international student performance, but differential validity may be an issue
- Negative non-significant relationships between cultural distance and IQ/OE scores and perceived cultural distance may be caution in generalizing country-level scores to individuals
- More research is needed regarding differential validity for international students.

For **international students**, **perseverance** and a sense of **social responsibility** are extra important for predicting first-year **GPA**.



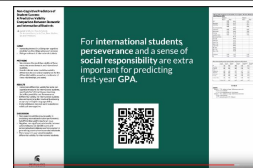
Variable	Mean	SD	Min	Max
SET	4.52	0.85	1.00	5.00
Continuous Learning	4.38	0.78	1.00	5.00
Social Responsibility	4.21	0.72	1.00	5.00
Perseverance	4.15	0.68	1.00	5.00
IQ/OE	112.5	15.2	70	150
Cultural Distance	1.8	0.5	1.0	2.5

## Problems



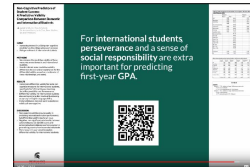
- Yes, location of the main point captures attention, but does so at the expense of the content
- 5! Tricks to grab attention is overwhelming and unnecessary
  - Colour, size, placement, contrast and font are all pulling your attention
  - This is like an attention sledgehammer
- Multiple fonts and reverse contrast makes reading harder!
  - Bold and italic attract attention, but use sparingly and consistently for continuity

## Problems



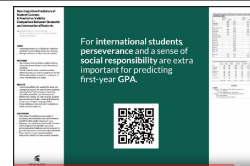
- Smaller content on the side is useless. This is hard to read even with perfect eyesight
  - Most professors use reading glasses
  - They need to fight to get within 2m of your poster
  - Lighting conditions will be suboptimal
  - If it's not important enough to use a readable font, remove it from the poster
- No graphs
  - Comparison of values is more important than precision of numbers
  - Is your main message that RT is 495ms? Or that condition 'A' is faster

## Problems



- Scan code is nice, but a digital phone doesn't need one that big
  - They will take a photo of your poster if their phone is out, so the scan code is just an extra step
  - Excellent idea for supplementary info
  - Maybe a presentation version (minimal) and home reading version (detail)
- No graphs
  - Comparison of values is more important than precision of numbers
  - Is your main message that RT is 495ms? Or that condition 'A' is faster

## Problems



- Main message should be your title
  - Title is what they are searching for (or name, or University)
  - I completely approve of one or two additional 'important' conclusions in very large print.
- White space
  - The best way to draw attention is to put NOTHING where attention shouldn't be
  - Pure Tufte