Poster Presentations

Spring 2025

Michigan Tech

Session Overview

- Introduction
- Effective Design
- Presenting
- Resources
- Poster Printing @ MTU

Introduction

- Poster presentations present unique challenges
- Walking into the poster area can feel overwhelming for everyone
- Audience participation is the ultimate goal!

Audience & Context

Who is at a poster session?

What are most people's goals at a poster session?

Audience & Context

Who is at a poster session?

- Experts and non-experts
- Funding organizations/stakeholders

What are most people's goals at a poster session?

- Learn new information
- Network
- Be inspired!

Effective Posters: Content

There are “standard” (not required!) sections

- Title
- Intro or Background
- Methods
- Results
- Conclusions
- References
- Acknowledgements

Effective Posters: Content

- Be Concise
  - Remember: Folks are wandering by
  - Do **NOT** copy & paste from a paper
  - Represent information visually

- What story are you telling about your work?
  - 1-2 big takeaways or points to focus on
  - Can be any section - does not need to be conclusion

Effective Posters: Design

Readability:

- Most of the poster visible from 6 feet
- Contrasting but pleasant colors
- White space & clear separation of content
- Sans Serif font. Generally:
  - Title 85 pts
  - Author 55 pts
  - Headings 36 pts
  - Text 24 pts
- Poster size is commonly 36”x 48”

Effective Posters: Design

- Flow
  - Where does your eye travel?
  - What visual story does your information tell?
- Clear Labels
  - Critical if you use non-standard sections, layout, headings, visuals

Effective Posters: Design

- What works and what does not in the following examples?

- Look for:
  - Flow
  - Arrangement
  - Images
  - White Space
  - Color
  - Font/Size
  - Consistency

Does Phosphorylation of a Conserved Tyrosine Regulate CK1 Activity?

S. Elise McMahen[1], Wesley Carlisle[1], Jonathan Carrere[1], Marci McMahen[1], Lucy Robinson[2], Cynthia Brame[1]
[1] Department of Biology, Centenary College of Louisiana, [2]Department of Biochemistry, Louisiana State University-Health Sciences Center

Introduction

A conserved gene is a gene that has remained unchanged throughout evolution so that its sequence is similar in multiple species; conservation occurs if the organism cannot tolerate loss of the gene's function. These genes encode various conserved proteins, including protein kinases, which are enzymes that catalyze the phosphorylation and subsequent activation of other proteins. Specifically, we are investigating the conserved features within the CK1 protein kinase subfamily using a model CK1 called YCK2. While CK1 enzymes exhibit several conserved features found throughout the kinase superfamily, they also contain several family specific features, including a characteristically long activation loop (Longenecker et al. 1995; Nolen et al. 2004). The structure of CK1 enzymes (Figure 1) consists of a large subunit, a small subunit, and a substrate binding cleft (Hanks and Hunter 1995). In some inactive kinases, the activation loop blocks the substrate binding cleft, therefore inhibiting the substrate from binding. Previous studies have suggested that CK1s can be phosphorylated and that this phosphorylation may be inhibitory, causing a change in conformation of the activation loop which inhibits substrate binding and therefore activation of the CK1. However, where this phosphorylation takes place is unknown (Nolen et al. 2004; Adams 2003). Because this phosphorylation may take place somewhere in the activation loop (Carmel et al. 1994), we chose to investigate the function of the tyrosine (Y) amino acid within the ^{223}YRD^{225} sequence at the beginning of the activation loop. To determine if this tyrosine is a site of phosphorylation for enzyme inhibition, mutations were made within the tyrosine codon (TAT). Using site-directed mutagenesis, either a phenylalanine (F) or glutamic acid (E) was substituted for the existing tyrosine.

We hypothesize that substituting glutamic acid for tyrosine will mimic phosphorylation of tyrosine and will result in significant inhibition of enzyme activity. Substituting phenylalanine for tyrosine will serve as a negative control for the reaction because it has similar properties as tyrosine yet cannot be phosphorylated. We expect our negative control to have no effect on enzyme activity, because no inhibition will be involved.

Figure 1. The YRD sequence of interest in *Schizosaccharomyces pombe*. The portion of the structure containing the sequence YRD is highlighted in yellow. The sequence contains the first three amino acids in the activation loop. We generated substitution mutations to the tyrosine (Y) to test the hypothesis that it is a regulatory phosphorylation site.

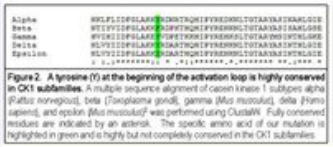


Figure 2. A tyrosine (Y) at the beginning of the activation loop is highly conserved in CK1 subfamilies. A multiple sequence alignment of casein kinase 1 subtypes alpha (*Rattus norvegicus*), beta (*Toxoplasma gondii*), gamma (*Mus musculus*), delta (*Homo sapiens*), and epsilon (*Mus musculus*)[was performed using ClustalW. Fully conserved residues are indicated by an asterisk. The specific amino acid of our mutation is highlighted in green and is highly but not completely conserved in the CK1 subfamilies.

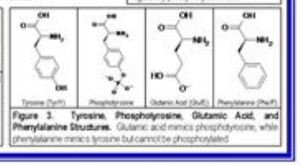


Figure 3. Tyrosine, Phosphotyrosine, Glutamic Acid, and Phenylalanine Structures. Glutamic acid mimics phosphotyrosine, while phenylalanine mimics tyrosine but cannot be phosphorylated.

Procedure

Site-directed mutagenesis was used to generate mutant GFP-YCK2 alleles in the pLR10 vector, which was transformed into *Escherichia coli* for replication (Figure 4A). After cloning the mYCK2 in *Escherichia coli* and recovering the pLR10 vector, the GFP-mYCK2 DNA was sequenced to verify introduction of the desired mutation. The GFP-mYCK2 DNA was then transferred into the pRS315 vector. After cloning in *Escherichia coli*, the pRS315-mYCK2 vector was recovered and transformed into yeast for functionality assays (Figure 4B).

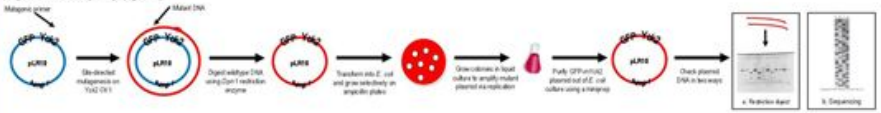


Figure 4A. Mutating YCK2 in the pLR10 vector and transforming the vector into *Escherichia coli*. The YCK2 CK1 enzyme is mutated within a pLR10 vector. After cloning the vector in *Escherichia coli*, the pLR10-mYCK2 DNA was purified out of the cells. We verified that the mYCK2-pLR10 construct was recovered using a restriction digest and by sequencing.

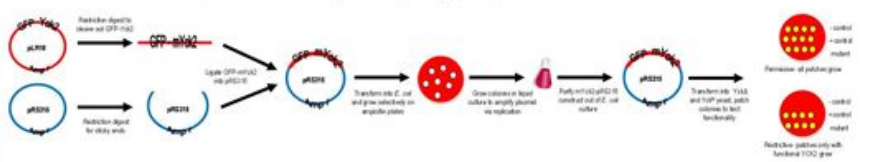
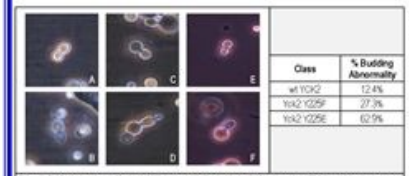


Figure 4B. Transferring the GFP-mYCK2 DNA to the pRS315 vector and transforming into yeast to test the functionality of the gene. The GFP-mYCK2 DNA was ligated into a pRS315 vector and cloned in *Escherichia coli*. The plasmid was then purified from the cells and transformed into yeast. The pRS315 vector will allow for expression of the mYCK2 gene in yeast to test for functionality.

Results and Discussion

Figure 4. Alignment of mYCK2 nucleotide sequences with wildtype YCK2 sequence. The desired mutations were ^{673}TAT^{675} to ^{673}CAG^{675}, corresponding to substitution of glutamic acid for tyrosine-225 (Y225E), and ^{673}TAT^{675} to ^{673}TTT^{675}, corresponding to substitution of phenylalanine for tyrosine-225 (Y225F), which were successfully introduced via site-directed mutagenesis. YCK2 sequences from the yeast genome database (www.yeastgenome.org) were aligned with pLR10 mYCK2 using BLAST.



Class	% Budding Abnormality
wt YCK2	12.4%
Yck2 Y225F	27.3%
Yck2 Y225E	62.9%

Figure 6. Substitution of phenylalanine and glutamic acid for tyrosine-225 leads to increased budding abnormalities. Yeast cells expressing wildtype Yck2 (A,B), Yck2 containing the Y225F substitution (C,D) and Yck2 containing the Y225E substitution (E,F) were examined by phase-contrast microscopy at 400X. Examples of yeast budding normally (A,C, E) and abnormally (B,D,F) are shown. Budding yeast cells expressing mutant Yck2 have a greater percent budding abnormality than budding yeast cells expressing wildtype Yck2. Budding abnormality is especially high in cells that have a glutamic acid residue substituted for tyrosine-225.

To determine if the desired mutation was introduced, pLR10 Y225F and pLR10 Y225E sequences were aligned with the wildtype YCK2 sequence using the BLAST tool from the Saccharomyces Genome Database. The sequencing results of both the Y225E and Y225F mutations confirmed that the desired mutations were successfully introduced via site-directed mutagenesis (Figure 4). The mutations ^{673}TAT^{675} to ^{673}CAG^{675} and ^{673}TTT^{675} correspond to substitutions of tyrosine for glutamic acid and phenylalanine.

YckΔ yeast (*Saccharomyces cerevisiae*) were transformed with a expression vector pRS315 (negative control), pRS315 containing wildtype Yck2 (positive control), and pRS315 containing mutant Yck2 sequences (experimental) to perform a functionality assay. YckΔ yeast do not have a functional Yck1 or Yck2 allele but do have a high-copy plasmid which contains a functional wildtype Yck2 allele and a functional *URA3* allele. Growth under permissive conditions, -Leu medium, allows growth of all yeast colonies that were successfully transformed with a pRS315 vector because the vector contains a Leu2 allele. Because fluoroorotic acid (FOA) cleaves uracil into a toxic byproduct (5-fluorouracil), replica plating to a medium containing FOA (a restrictive condition) selects for cells that have lost the high-copy plasmid and have been successfully transformed with a functional Yck2 allele from pRS315. Cells that have been transformed with pRS315 Y225F exhibit growth on FOA (Figure 5); therefore, the Y225F mutations appears to have no inhibitory effect on the enzymes activity. Because cells that were transformed with pRS315 Y225E show no growth on FOA-containing medium (Figure 5), it appears that the cells do not exhibit essential Yck activity. The data suggest that the Y225E mutant allele is nonfunctional.

Figure 5. Y225E mutants exhibit no growth under restrictive conditions, while Y225F mutants show no observable difference in growth from positive control. YckΔ yeast cells, which contain no functional Yck1 or Yck2 alleles but do contain a high-copy plasmid with functional Yck2 allele, were grown on -Leu medium to select for pRS315 transformants. The negative control contained only pRS315 , the positive control contained pRS315 containing functional Yck2, and the experimental contained pRS315 Y225F or pRS315 Y225E. The yeast were replica plated onto fluoroorotic acid (FOA) to select for yeast which have lost the high-copy plasmid.

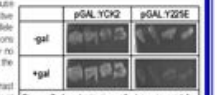


Figure 7. A substitution of glutamic acid for tyrosine-225 (Y225E) leads to identification of a dominant negative allele. Yeast cells with an endogenous, functional Yck2 allele, were transformed with pGal, an inducible vector, containing YCK2 and Y225E, respectively. In the absence of galactose, the Y225E allele is not expressed and the endogenous allele is expressed. In the presence of galactose, the activity of the mutant allele inhibits endogenous Yck2 activity.

To determine if the mutant YCK2 alleles caused morphological abnormalities, the yeast were examined using phase contrast microscopy. We observed one hundred yeast cells expressing each of the mutations to determine if they were budding normally or abnormally. The Y225F mutants (Figure 6C-D) and the Y225E mutants (Figure 6E-F) that were budding had a higher percentage of abnormally budding yeast compared to budding wildtype yeast (Figure 6A-B). The Y225E budding mutants exhibited a higher percentage of abnormal budding (62.9%) than the Y225F budding mutants (27.3 %) (Figure 6).

To better understand the effect of the Y225E substitution on the enzyme's function, wildtype YCK2 and YCK2 Y225E were ligated into an inducible vector pGal. In the presence of galactose, pGal expresses the inserted allele. Wildtype yeast with functional Yck2 allele were transformed with the respective pGal vectors. When transformed with pGal containing wildtype Yck2, the enzyme is functional in the presence and absence of galactose (Figure 7); in the absence of galactose, the endogenous Yck2 gene is expressed. In the absence of galactose, cells transformed with pGal Y225E express their endogenous Yck2 gene and function normally (Figure 7). In the presence of galactose, however, pGal expresses mYCK2 in such a way that it is able to inhibit the function of the endogenous Yck2 enzyme (Figure 7). Though the exact mechanism remains unknown, the data suggest that Y225E is a dominant negative allele.

Conclusions

- Confirmed by sequencing (Figure 4), phenylalanine and glutamic acid were successfully substituted for tyrosine-225 of the Yck2 gene via site-directed mutagenesis.
- The functionality assays using YCKΔ strains of yeast (Figure 5) revealed that substitution of phenylalanine for tyrosine-225 (Y225F) leads to a functional mutant allele. Substitution of glutamic acid for tyrosine-225 (Y225E), however, results in a nonfunctional mutant allele.
- Both mutants exhibited higher amounts of abnormally budding yeast cells compared to the wildtype yeast cells, while the Y225E mutant gave rise to much higher percentage of abnormally budding yeast in the population compared to the Y225F mutants (Figure 6).
- Expression of the Y225E mutant allele in the inducible pGal vector (Figure 7) inhibits endogenous YCK2 activity. **These data are evidence that tyrosine-225 is a site of phosphorylation. This phosphorylation along the characteristically long activation loop appears to be inhibitory to CK1 enzyme function.** Furthermore, because enzymes expressed from the Y225E mutant allele mask the function of enzymes expressed from the endogenous YCK2 allele, the data suggest that the Y225E appears to be a dominant negative allele.
- Future investigations may include phosphorylating the ^{225}Y amino acid *in silico* to determine if the phosphorylation event changes the structure of the YCK2 protein. Additionally, an enzyme assay could be used to quantify enzyme activity of wild type and experimental classes.

References

Adams, J.A. Activation Loop Phosphorylation and Catalysis in Protein Kinases: Is There Functional Evidence for the Autoinhibitor Model? Biochemistry. January 2003. Vol 42. 601-607.
Carmel, G., Leichus, B., Cheng X., Patterson, S.D., Mary, U. Expression, Purification, Crystallization, and Preliminary X-ray Analysis of Casein Kinase-1 from *Schizosaccharomyces pombe*. Journal of Biological Chemistry. 1994. Vol 269. 7304-7309.
Hanks, S.K., Hunter, T. The Eukaryotic Protein Kinase Superfamily: Kinase (Catalytic) Domain Structure and Classification. The FASEB Journal. May 1995 Vol. 9. 576-596.
Longenecker, K.L., Roach P.J., Hurley T.D. *Three-Dimensional Structure of Mammalian Casein Kinase I: Molecular Basis for Phosphate Recognition*. Journal of Molecular Biology. 1996. Vol. 257. 618-631.
Nolen, B., Taylor S., Ghosh, G. Regulation of Protein Kinases: Controlling Activity through Activation Segment Conformation. Molecular Cell. September 2004. Vol 15. 661-675.

Go Forth and Measure, Version 0.1 — Spring 2012

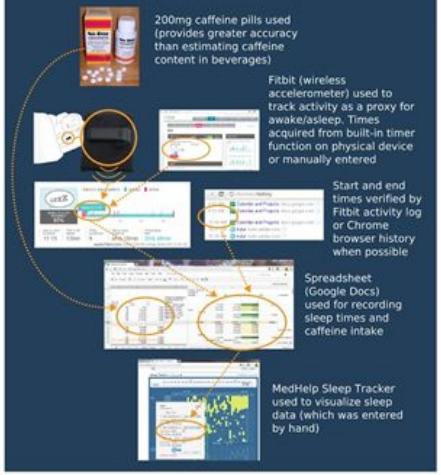
Effects of Caffeine on Sleep

Nancy Ouyang

Motivation

- Explore relationship between caffeine and sleep (important to many **university students**)
- Address caffeine's effect on sleep at the **individual level** (other studies reveal population-level trends)
- Investigate the role that commercial tools can play in the growing **citizen science / quantified self** movements

Experimental Setup



Background Information

Per capita (including non-coffee drinkers) Americans average about one and a half cups of coffee a day. [1] A cup of coffee contains roughly 100mg of coffee (up to 200mg), so on average Americans consume 150mg of caffeine daily (neglecting caffeinated soft-drink consumption). [2]

Methods

Study consisted of three phases.
Phase 1 / Week 1: self-administered caffeine as wanted for 1 week
Phase 2 / Week 4: third week with no caffeine (two weeks for withdrawal symptoms)
Phase 3 / Week 5: three days on 600mg in one dose daily
Phase 3 was canceled early due to the sleep deprivation and elevated anxiety side-effects. "Phase 4" was a regular sleep-schedule enforced by being in the hospital.

Results and Discussion

MedHelper visualizations of the sleep data for each of the four phases follows.

Phase 1 - "Caffeinate as needed"

Averaged 100mg total daily over two weeks. Subject has very scattered baseline sleep schedule (compare to phase four chart).

Phase 2 - "No caffeine nor caffeine withdrawal effects"

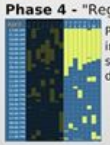
No real change; sleep may be slightly more consolidated compared to phase one.

- The subject was not a regular coffee drinker, but did have an irregular baseline sleep schedule to begin with

Phase 3 - "Controlled high caffeine dose"

Phase 3 demonstrates initial strong effect on sleep (dip down to four hours on first day) followed by rapid development tolerance to caffeine over the following two days.

Phase 4 - "Regular sleep schedule"



Phase 4 demonstrates the drawbacks of a within-individual study, where data can only be collected serially and it is difficult to have a backup or determine if different stressors impacted sleep.

- Decision was made to neglect the placebo effect, since previous studies indicated subjects were noticeably affected by caffeine and not placebos
- Other studies indicated mood / stress level had more impact on sleep than caffeine, and 100mg/day seemed to have almost no effect on sleep schedule, so strong effect on sleep at 600mg/day was a surprise

Conclusions

- Even for non-coffee-drinkers 1or 2 cups of coffee may not have a noticeable effect on daily hours of sleep
- Going from no caffeine to the equivalent of 6 cups of coffee daily had a strong effect on daily hours of sleep (but did not necessarily increase productivity)
- Further research could be done with more individuals, with mood tracking, with ambient light and noise levels as more variables, and the results aggregated to create a model of factors that

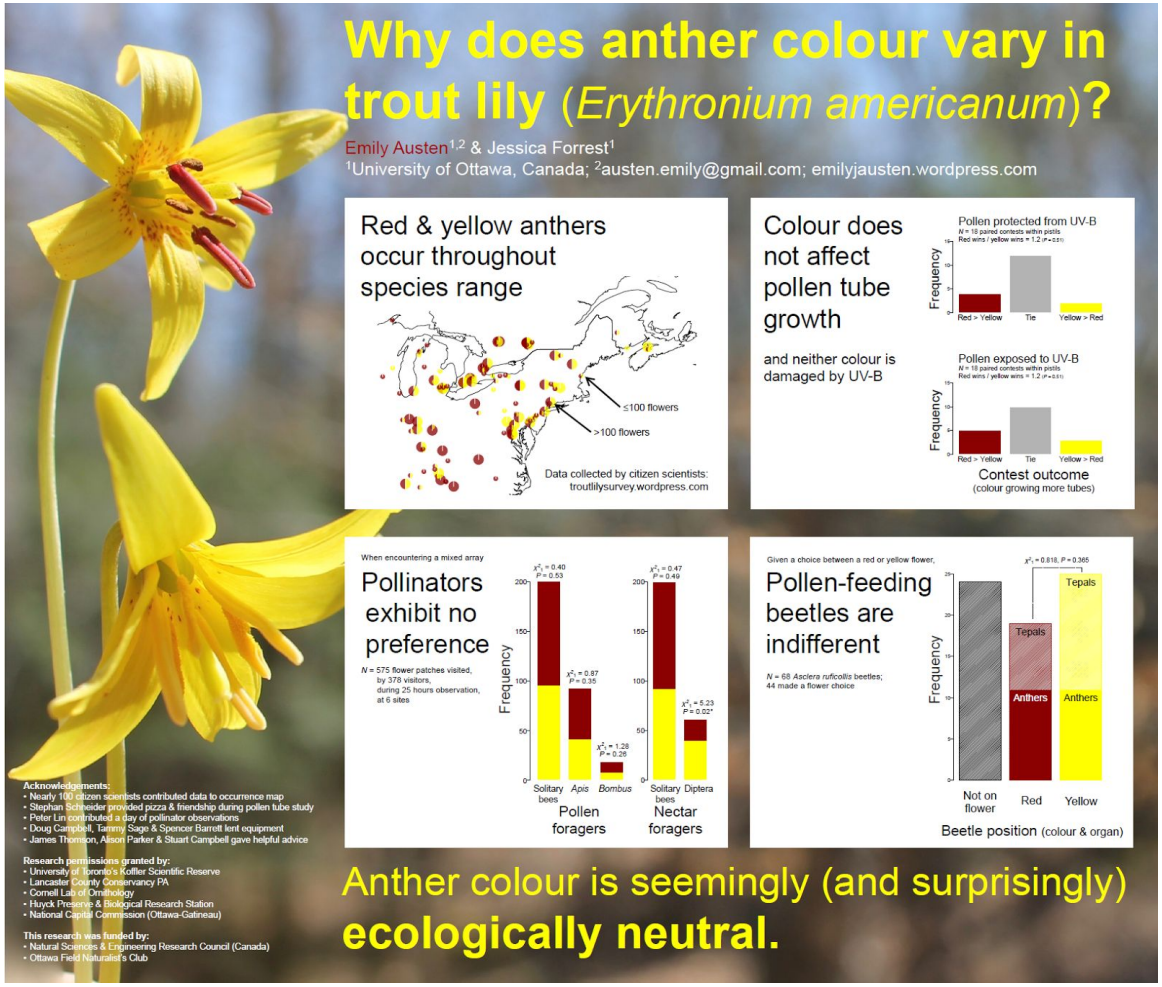
[1] http://www.coffeeresearch.org/market/usa.htm
[2] http://coffeefaq.com/site/how-much-caffeine

nouyang@mit.edu nouyang.blogspot.com 2.671 Measurement and Instrumentation

Retrieved from: http://bit.ly/PosterExample1

Retrieved from: http://bit.ly/PosterExample1

Michigan Tech



Austen, E. (2016). *Anther Colour*. Evolution conference, June 2016. Retrieved from: https://sites.google.com/view/postergallery?pli=1

Michigan Tech

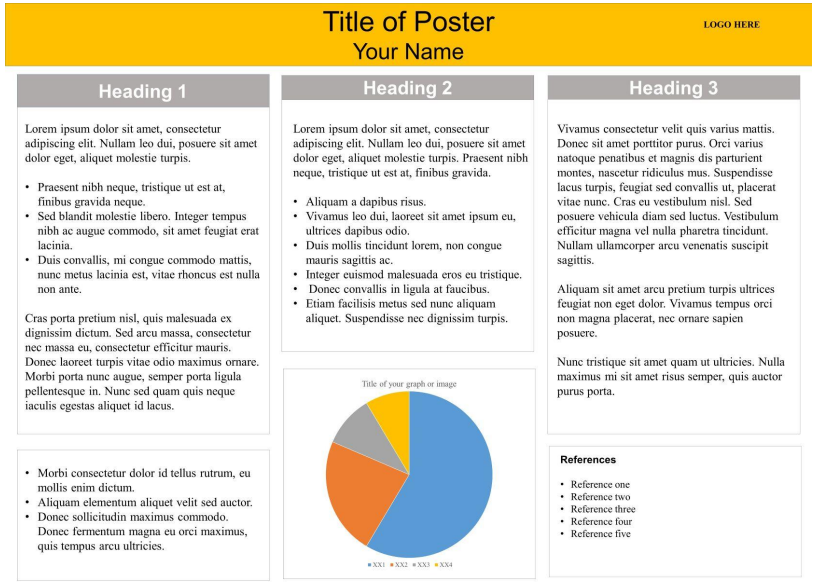
Effective Posters: Layouts

- There are several types of layouts
  - Check conference or symposium rules

- Traditional and “Better Poster” styles
  - Traditional layout- careful to not be too cluttered
  - “Better Poster”- New research indicates layout generates more attention
    - Reduces cognitive load
  - MIT created a hybrid version of the traditional and better poster that can be found here: Even Better Poster Template

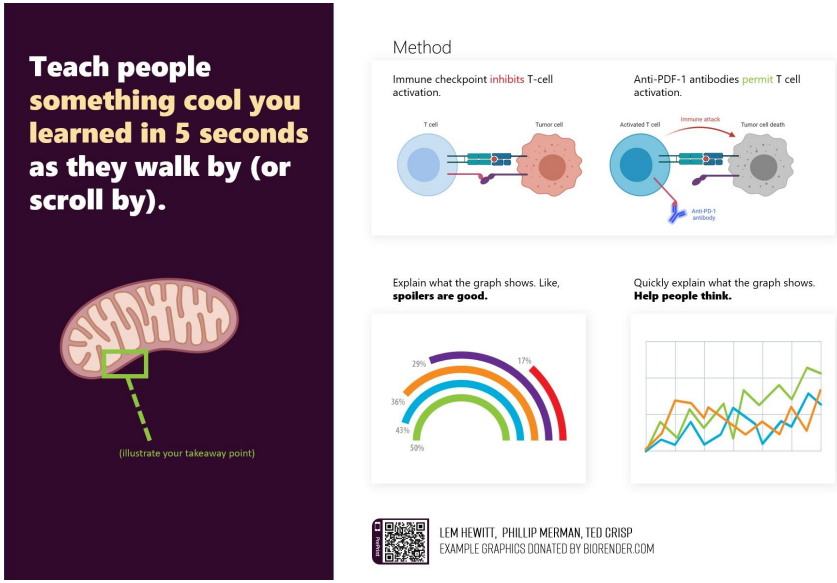
Effective Posters: Layouts

Traditional



Modified from: https://guides.lib.wayne.edu/posters/templates

"Better Poster"



Retrieved from: https://osf.io/ef53g/ Mike Morrison CC0 1.0 Universal

Michigan Tech

Presenting Posters

Presenting Your Poster

- Poster sessions are different than traditional presentations
  - Audience driven
- Be prepared
  - Wide variety of questions from different perspectives

Presenting Your Poster

- Demeanor and etiquette
  - Be friendly, confident, and polite
  - Introduce yourself
  - Don’t stand right in front of the poster
  - Include newcomers into the conversation

- Content: Be brief and simple
  - Develop an “elevator pitch” that hits the key points
  - Allow people time to look and then ask questions
  - Consider what level of jargon is appropriate

Presenting Your Poster: Elevator Pitch

Elevator Pitch

- What is it? Why do I want one?
  - An interesting & brief summary of your project and its importance
  - Used to spark interest and draw in listeners
  - Sometimes looks like: “Problem, why it’s important, my solution”

Presenting Your Poster: Elevator Pitch

Talking Points

- Use talking points to share your project in a consistent and concise manner
- Write down points that you know you want to share
- Make sure you don't spend too much time on one point/leave too little time to get to the other ideas you want to share

Practice!

- At your tables, think of 3 key talking points for your research. (5 minutes)
- In 1 minute, use those talking points to discuss your thesis with your table partners.
- After 1 minute, switch so the other partner can try.

Supplemental Information

Consider bringing:

- Business cards
- Handout
- A link or QR code for more info, reference list, etc.

Effective Posters: Resources

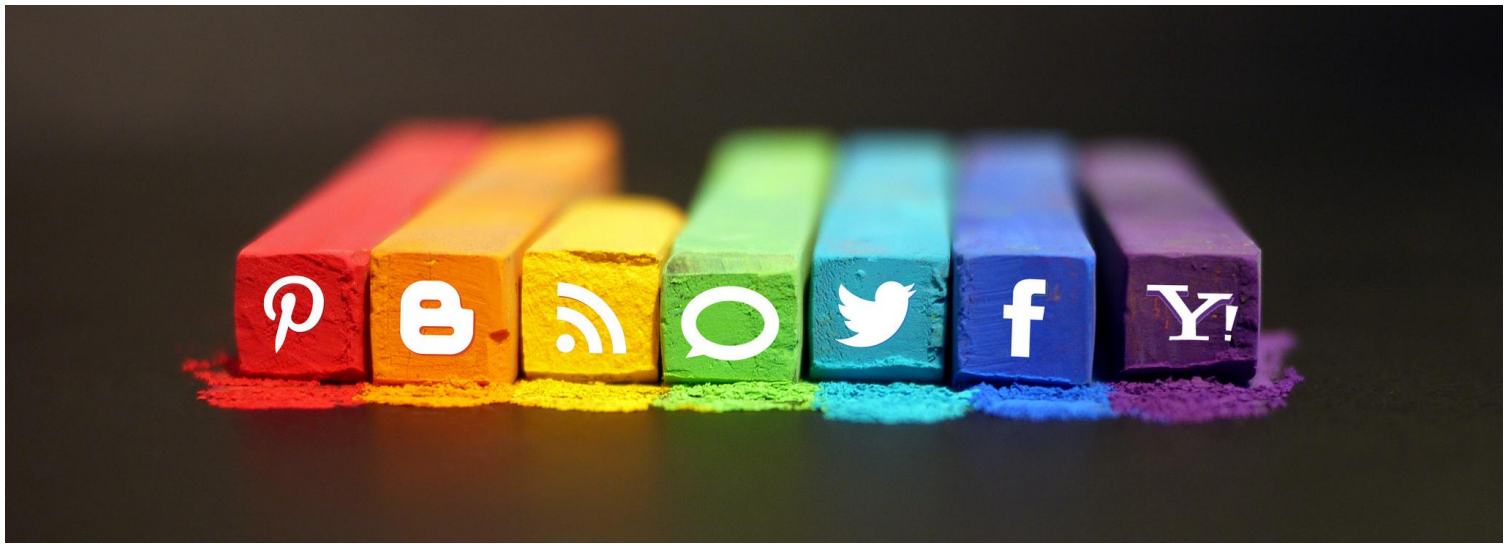


Image Credit: mkhmarketing
mkhmarketing. (2011). *The Art of Social Media* [Online image]. Retrieved from https://www.flickr.com/photos/mkhmarketing/

Effective Posters: Create!

- Common Poster Design Tools:
  - PowerPoint
  - Google Presentations
  - Adobe Illustrator or InDesign
  - Microsoft Publisher
  - Canva
  - Scribus

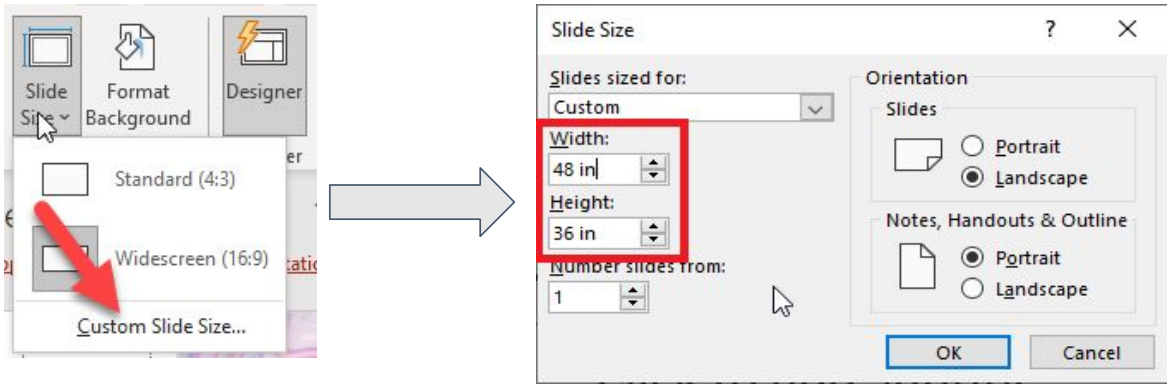
Effective Posters: Create!

- Common Poster Design Tools:
  - **PowerPoint**
  - Google Presentations
  - Adobe Illustrator or InDesign
  - Microsoft Publisher
  - Canva.com
  - Scribus

Very basic PPT template on the Library Guide
http://libguides.lib.mtu.edu/posters

Effective Posters: PowerPoint Tricks

Customize size under “Design” tab: 36” x 48” is common



PowerPoint will not make a slide larger than 56 inches

- Set to a proportional width/height (30”x20”)
- Scale up when printing
- Check resolution

Michigan Tech

Effective Posters: PowerPoint Tricks

- Use grids to align text and image boxes
  - Allow you to plan out your use of white space
  - Creates clean, organized look

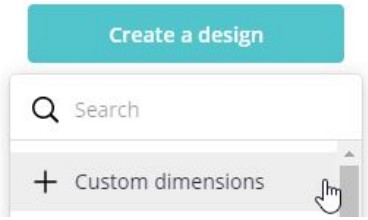
- Maintain consistent text box margins
  - Right click text box to edit and select “Format Text Effects”
  - Choose the Text box icon (on the right)

Effective Posters: Tools & Resources

- Common Poster Design Tools:
  - PowerPoint
  - Google Presentations
  - Adobe Illustrator or InDesign
  - Microsoft Publisher
  - **Canva.com**
  - Scribus

Effective Posters: Canva Tricks

- Create a new design & set custom dimensions
  - Standard is 48” (W) x 36” (H)



- Drag & Drop text, images, and shapes onto poster
  - Less control - can be good or bad!
  - Can import own images

- Download as Print PDF

Effective Posters: Images

- Freely available images:
  - Pixabay
  - Wikimedia Commons
  - Use Advanced Google Image Searching to limit to images labelled for ‘reuse’

- Designing your own visuals
  - SHARC Framework

Effective Posters: Images

- Create tables, graphs, & infographics
  - Excel
  - Google Drive
  - Canva*
  - Easel.ly*
  - PiktoChart*
  - Chartle.com

*account set up necessary and some customizations require a paid account

Effective Posters: Copyright

- Generally, you cannot use images, charts, graphs, etc. that you have *not created* UNLESS:
  - You get permission from the creator
  - The work is licensed as “public domain” or “creative commons” (or some other similar license)
    - CC license types
    - CC attribution

Effective Posters: Color

- Pleasant but contrasting color schemes
- Think of accessibility!
  - IBM and Tol accessible color palettes
  - Resources for color accessibility
- Color palette websites
  - https://coolors.co/
  - https://colorpalettes.net/

Effective Posters: Logos

- University Marketing: include Michigan Tech logos and branding

- May need to include logos from partner institutions, funding agencies, etc.

Effective Posters: Printing at Michigan Tech

- Self-Serve large format printer (Library)
  - Save your poster in pdf, jpg, or tiff file
    - NOT .ppt or .pptx
  - Bring it on a thumb drive
  - $2.5/sq foot

Effective Posters: Printing at Michigan Tech

CHECK THE SCALE

1. Before you start
2. Before you print

Additional Help

Check out the Research Poster Library Guide:
https://libguides.lib.mtu.edu/posters

Contact us:
Visit in-person
Email: reflib@mtu.edu
Call: (906) 487-2507
Chat: mtu.edu/library