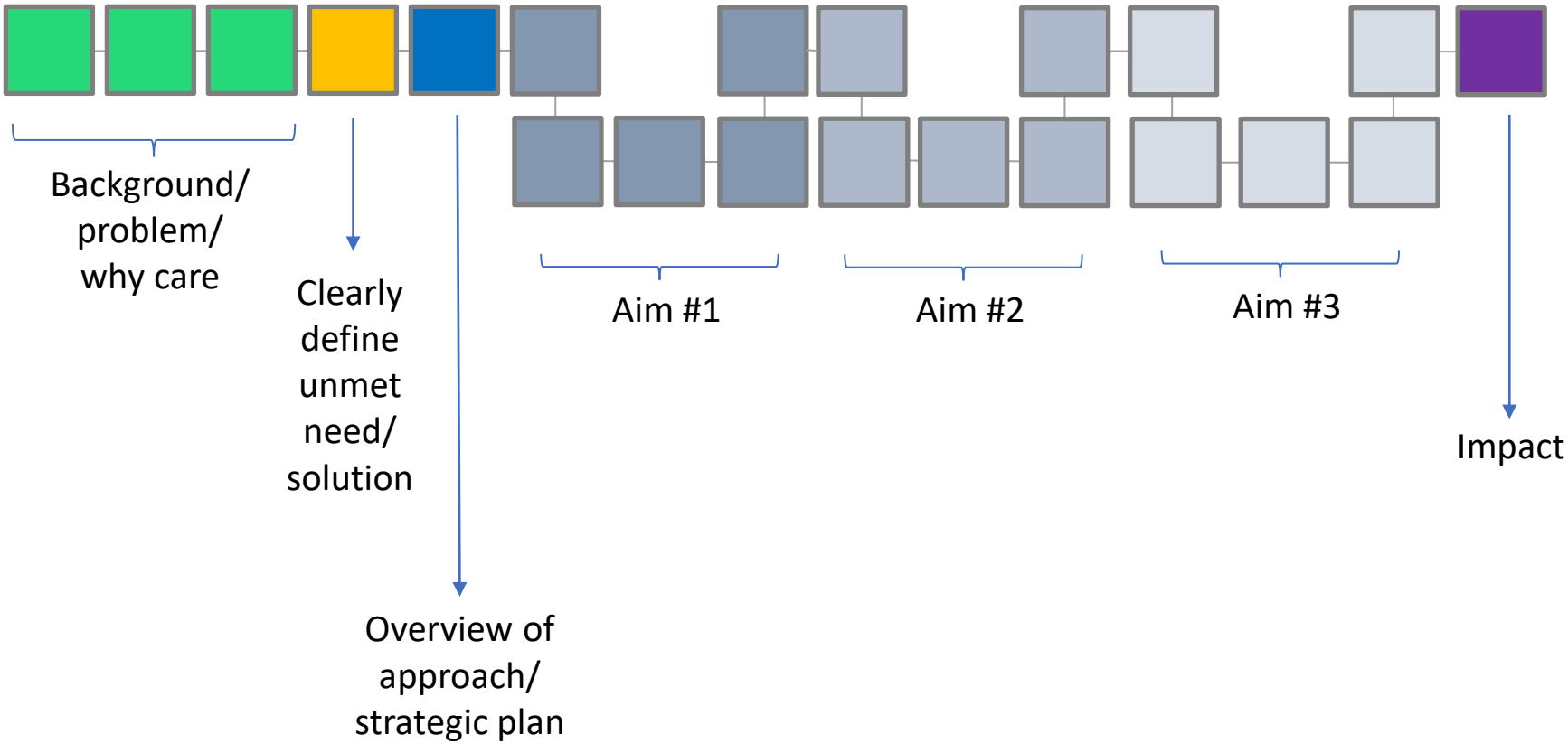
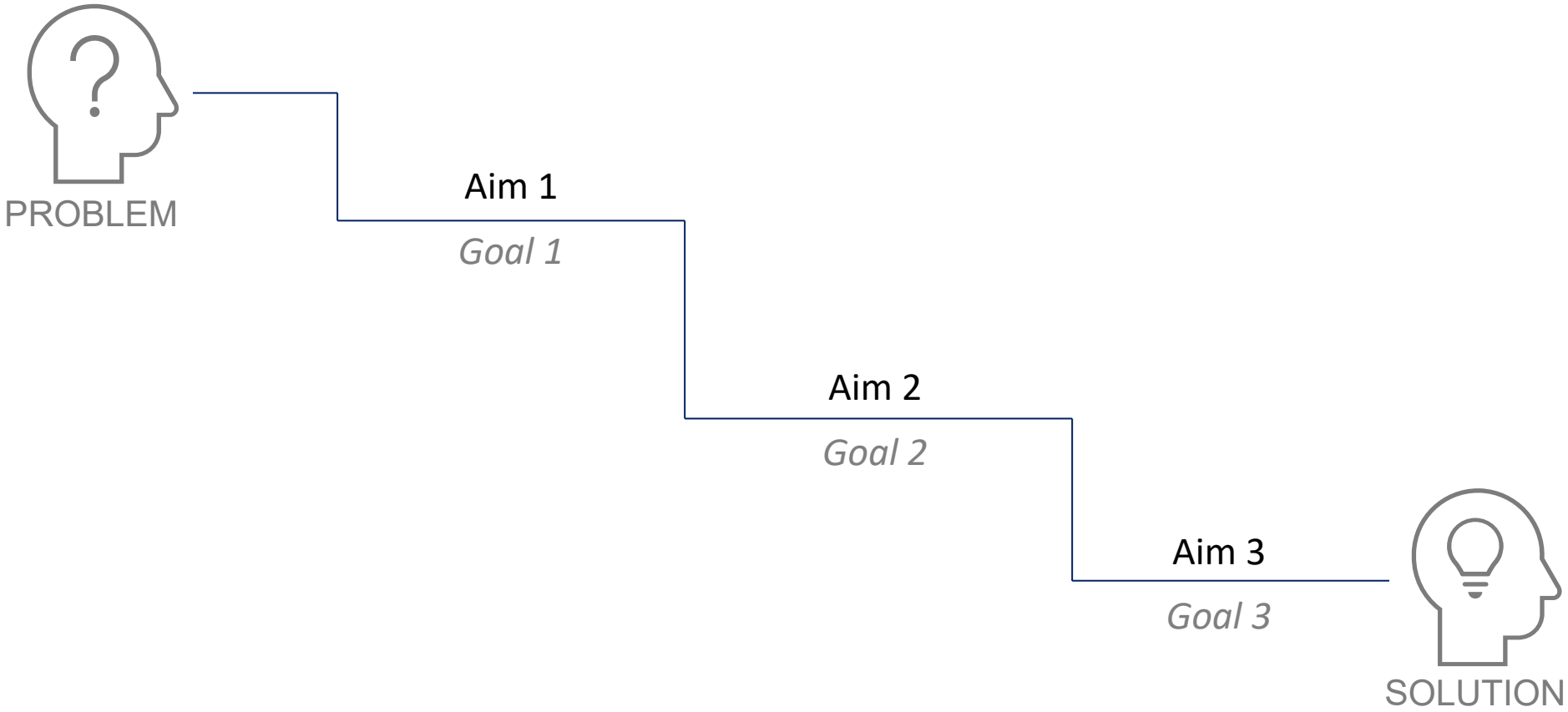
Strategies for structuring a research proposal talk

Additional Resources

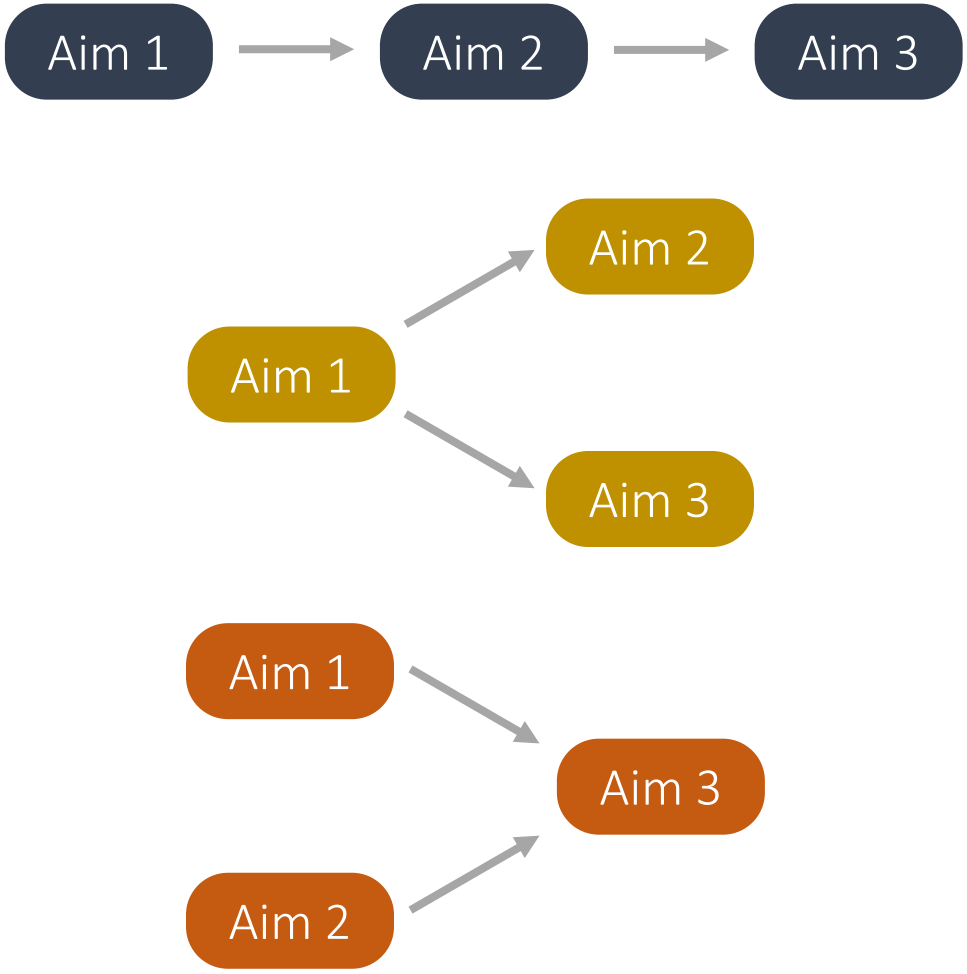
Your whole presentation might look like this



Your specific aims should address critical steps needed to achieve your larger project



Your aims may be connected to each other in different ways



Your aims *can* be interdependent, but only if you can demonstrate that they will not fail

"What would it look like for this Aim to be successful?"

Aim titles should be concrete

Each aim should have a clear goal that is easily defined.

Use wording that assures success.

Use verbs that convey a clear endpoint.

Specific: isolate, determine, identify, define, discover, elucidate, ascertain
Vague: examine, explore, evaluate, study, investigate

Focus on the outcome rather than the method.

Vague (for hypothesis-driven aims): perform, measure, characterize, describe, compare, catalog, correlate

Use parallel grammatical structure.

Make the aim statements clear and concise.

https://www3.mdanderson.org/library/education/pdf/crafting-strong-specific-aims-handout.pdf

“What would it look like for this Aim to be successful?”

Aim titles should be concrete

Each aim should have a clear goal that is easily defined.

The feasibility of each aim should be justified.

Make it clear **how** and **which** data would be gathered, and how they would be **interpreted**.

For each **aim**, we want to know:

a) Experimental Rationale
b) Experimental Plan
c) Expected Results
d) Potential Challenges and Solutions

- Why you are doing this
- What you will do
- What you will learn
- What happens if this doesn't work as expected
- How this will further your project

Explain **why** you picked a specific approach

a) Experimental Rationale
b) Experimental Plan
c) Expected Results
d) Potential Challenges and Solutions

Why did you choose this approach and not another one to answer your question?

What evidence exists that supports its feasibility?

Tell us what you plan to do

a) Experimental Rationale
b) Experimental Plan
c) Expected Results
d) Potential Challenges and Solutions

Outline major methods, experiments, tests.

How do you obtain the data needed to dis/prove your hypothesis?

Tell us what you expect to see

a) Experimental Rationale
b) Experimental Plan
c) Expected Results
d) Potential Challenges and Solutions

Use schematics and other visuals to help us imagine outcomes.

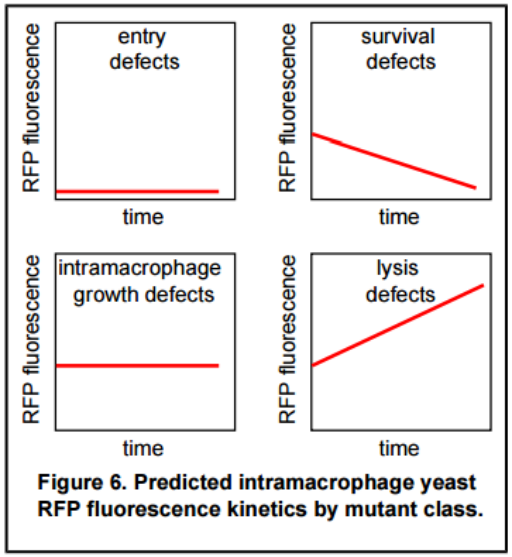


Figure 6. Predicted intramacrophage yeast RFP fluorescence kinetics by mutant class.

Tell us what you will do if you don't get expected results

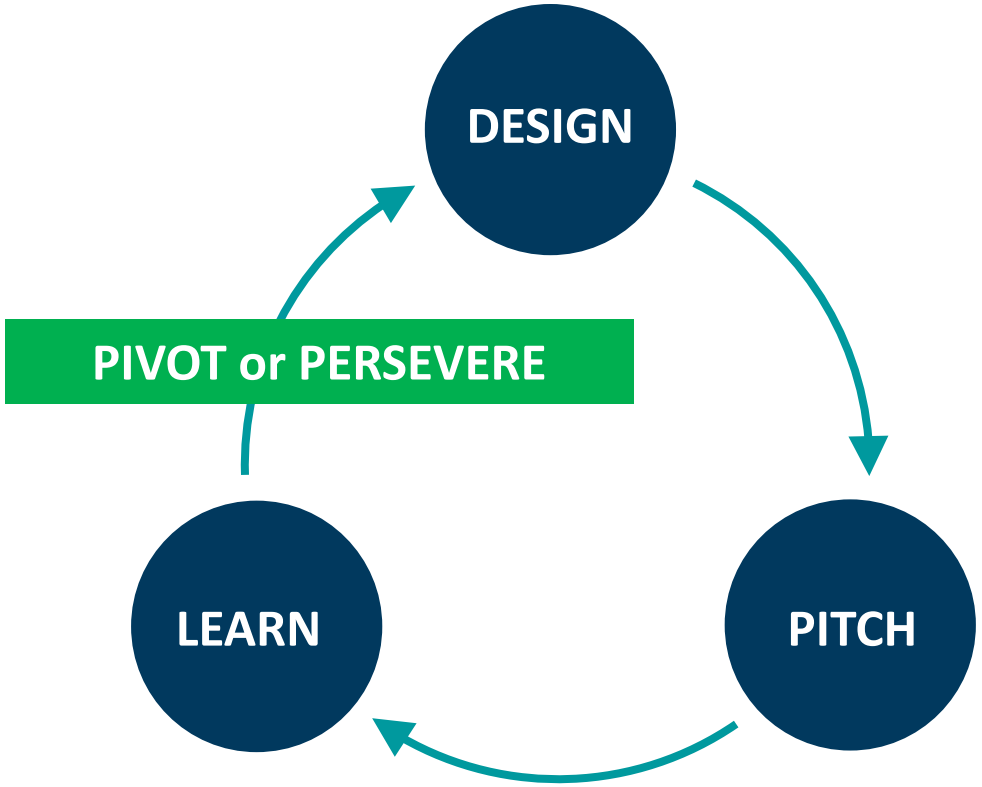
a) Experimental Rationale
b) Experimental Plan
c) Expected Results
d) Potential Challenges and Solutions

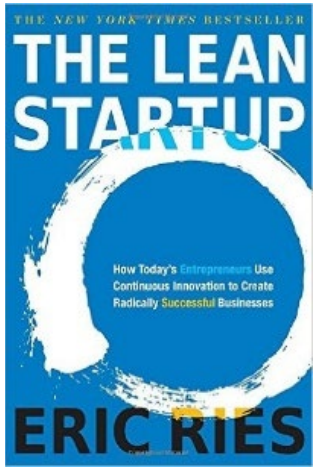
Every method has shortcomings. Reviewers will predict many: anticipate their concerns.

Suggest alternative approaches.

Demonstrate both the robustness of your plan, and the depth of your knowledge of the field.

Going through feedback loops improves your design





Stay **open to feedback**—it is how you learn and grow!

Be nimble and **pivot** or build support for your **intuition**

Example: successful NIH R03 research proposal (2-year project scope)

Impact

Solution

Unmet need

Attention getter

Title: In vitro source of human extracellular matrix to support tissue repair and regeneration

Public Health Relevance Statement

Tissue and organ failure from diseases or trauma pose substantial health issues and expense to society, and there exists an acute shortage of transplantable organs and available tissue material for organ repair. Here, we propose to develop therapeutic human tissue material from lab-grown three-dimensional (3D) human tissues that is unique from other existing laboratory methods of culturing 3D human tissues, because our system is superior in mimicking cells in healthy human tissues. We believe by better mimicking healthy tissue conditions, we can generate 3D tissues with tissue material that have enhanced efficacy for tissue repair.

https://reporter.nih.gov/project-details/9929626

Also see "Other resources" slide for more links to NIH grant examples

Example: successful NIH R03 research proposal (2-year project scope)

Impact

Solution

Unmet need

Attention getter

Title: In vitro source of human extracellular matrix to support tissue repair and regeneration

Abstract, excerpt:

"... In this R03, we will utilize our patented micro-mold technology to generate stable 3D scaffold-free human cardiac tissue with human cardiac fibroblasts, cardiomyocytes and cardiac microvascular endothelial cells and evaluate three decellularized protocols to generate optimal quality decellularized ECM in Aim 1. We will then develop, optimize and execute three complementary methods to evaluate protein composition between the different ECM, as well as to examine the quantity and injectability of the ECM in Aim 2. We envision these technologies can have other bioengineering applications to enhance human biomimicry, including microfluidic devices to study disease progression such as tumor invasion."

https://reporter.nih.gov/project-details/9929626

Also see "Other resources" slide for more links to NIH grant examples

Example: successful NIH R03 research proposal (2-year project scope)

Impact

Solution

Unmet need

Attention getter

Title: Deciphering the effect of human microbiota on Alzheimer's disease using C. elegans models of protein conformational diseases

Public Health Relevance Statement

There is no cure or effective treatment for Alzheimer's disease, primarily because its contributing factors have yet to be fully identified. Recently, it was discovered that bacteria may play a role in the onset and progression of Alzheimer's disease and other protein conformational diseases, suggesting a direct influence on host proteostasis. We propose to decipher the role of the human microbiome on host proteostasis using C. elegans models of protein conformational diseases.

https://reporter.nih.gov/project-details/10341111

Also see "Other resources" slide for more links to NIH grant examples

Example: successful NIH R03 research proposal (2-year project scope)

Impact

Solution

Unmet need

Attention getter

Title: Deciphering the effect of human microbiota on Alzheimer's disease using C. elegans models of protein conformational diseases

Abstract, excerpt:

"... we propose to further investigate the effect of bacteria on proteostasis using C. elegans models by: (I) determining the impact of intestinal colonization by all human microbiome bacterial isolates on host proteostasis and pathogenesis of AD, and (II) observing the effect of exogenous and endogenous butyrate on bacteria that enhance protein aggregation. Deciphering the effect that bacteria have on host proteostasis will ultimately provide a basis for the development of prophylactics, therapeutics, and biomarkers."

https://reporter.nih.gov/project-details/10341111

Also see "Other resources" slide for more links to NIH grant examples

Example: successful NIH R01 research proposal (4-year project scope)

Impact

Solution

Unmet need

Attention getter

Title: Synthetic toolkit for precision gene expression control and signal processing in mammalian cells

Public Health Relevance Statement

Methods that allow scientists to turn on and off genes in living cells are fundamental to biomedical research, and in particular to advancing the development of new therapies for many diseases, such as cancer and autoimmunity. However, tools for controlling gene expression in mammalian cells have significant limitations: they do not allow multiple genes to be controlled at once, cannot be triggered by many chemical and biological stimuli of interest, and do not provide precise control over how genes are expressed. To address this, we will develop a new toolkit that enables scientists to flexibly and rapidly create gene expression programs to precisely control mammalian cell behavior in response to diverse chemical and biological stimuli.

https://reporter.nih.gov/project-details/10584605

Also see "Other resources" slide for more links to NIH grant examples

Example: successful NIH R01 research proposal (4-year project scope)

Impact

Solution

Unmet need

Attention getter

Title: Synthetic toolkit for precision gene expression control and signal processing in mammalian cells

Abstract, excerpt:

"... Here we will develop and characterize mammalian self-assembling [synthetic transcription factors] that have superior properties for installation into human cells relative to existing tools. We will use these tools to develop three classes of gene expression controllers...(1) Inducible controllers regulated by orthogonal, FDA-approved drugs. (2) Cell-autonomous controllers that sense and process biological stimuli....(3) Signal integration controllers that can perceive and integrate multiple biological signals...We anticipate that this toolkit will be broadly used by researchers to enable precision gene expression control across mammalian systems, including in biomedical applications of synthetic biology, cell reprogramming, and cell-based therapeutics."

https://reporter.nih.gov/project-details/10584605

Also see "Other resources" slide for more links to NIH grant examples

Other resources

- From Prof. Jen Heemstra's blog: Research ideas, part 1: It's not magic (also parts 2-4 on the side)
- NIH Small Grant Program (R03): appropriate scale
  - Example applications via NIH NIAID (includes alternate approaches, summary statement of grant reviewer comments)
  - Database of funded NIH grants (lists abstract and public health relevance statements; can search by keywords, grant categories, etc.)
- "NIH Grant Applications: The Anatomy of a Specific Aims Page"
- "Introduction to the Specific Aims Page of a Grant Proposal"
- BE Research Guide: (email Howard Silver hsilver with questions or suggestions!)
- Previous workshops on wiki, BECL website

Remember the fundamental tips for good slide design

- **Maximize signal to noise**
- One message per slide
- Slide title is a message
- Use visuals/schematics when you can
- Minimally sufficient information

Adapt to presenting as a team

- Decide who will say what
- Can announce organization + transitions

  "I'll introduce our Question and Aims, and Chiara will talk about the Methods we'll use…"
- Stay visually quiet when you're not speaking
- Q&A: Share answers
- If worked on parts separately, do a final revision to ensure consistency between your individual sections

PRACTICE PRACTICE PRACTICE

Be sure your presentation includes:

- ❑ Sufficient background to orient the audience to the problem and current state of the field
- ❑ A strong problem statement/knowledge gap
- ❑ A clear proposal statement/hypothesis
- ❑ Clear aims/goals that follow a logic leading to the end goal
- ❑ Succinct methods highlighting what you will do
- ❑ Alternate approaches
- ❑ Strong impact statement

Your slides and presentation should:

- ❑ Convey a single message per slide
- ❑ Have titles that are messages
- ❑ Only contain relevant material (reduce noise)
- ❑ Include schematics to help your audience
- ❑ Be organized to share the speaking between presenters