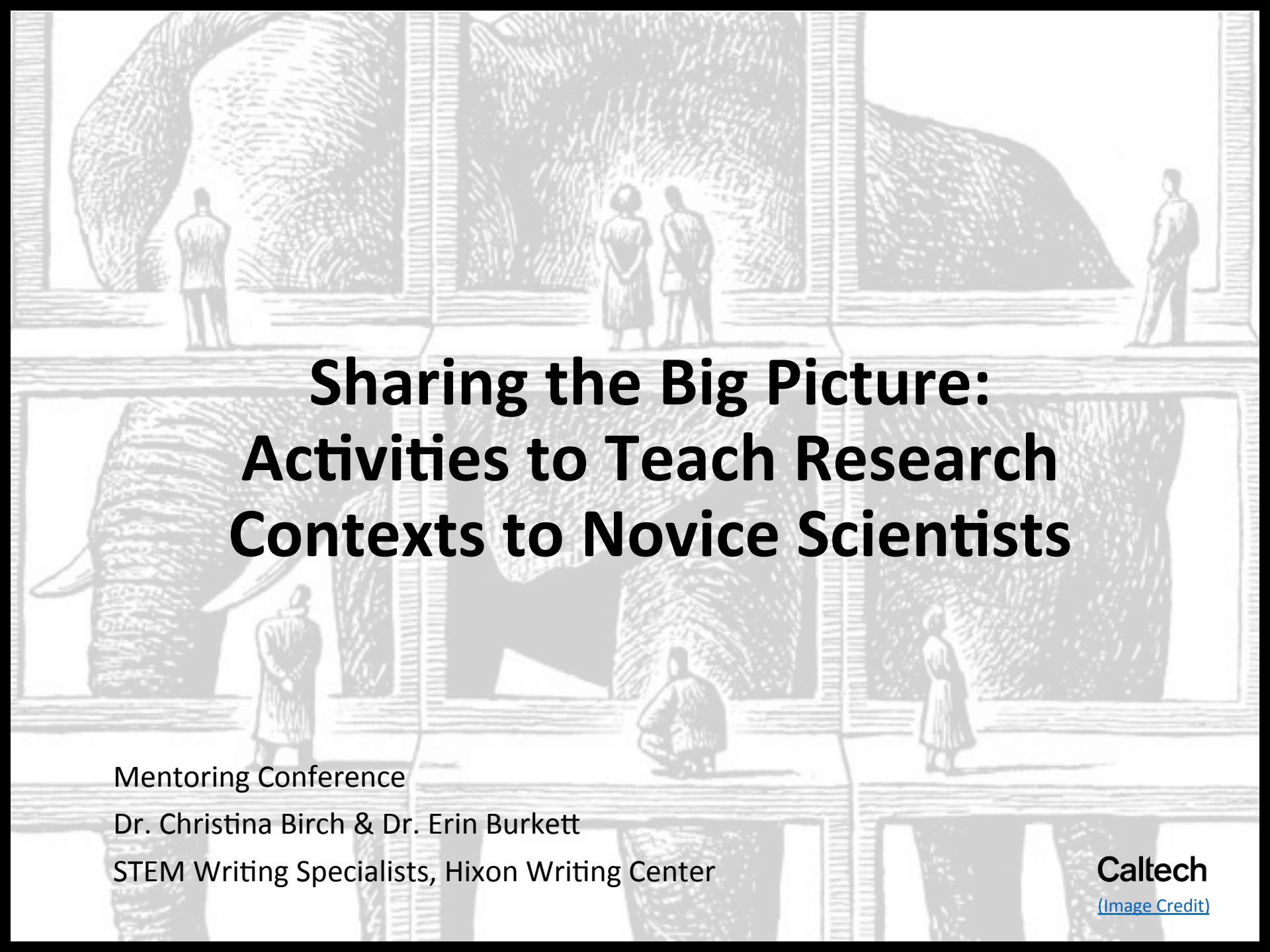


Sharing the Big Picture: Activities to Teach Research Contexts to Novice Scientists

Mentoring Conference

Dr. Christina Birch & Dr. Erin Burkett

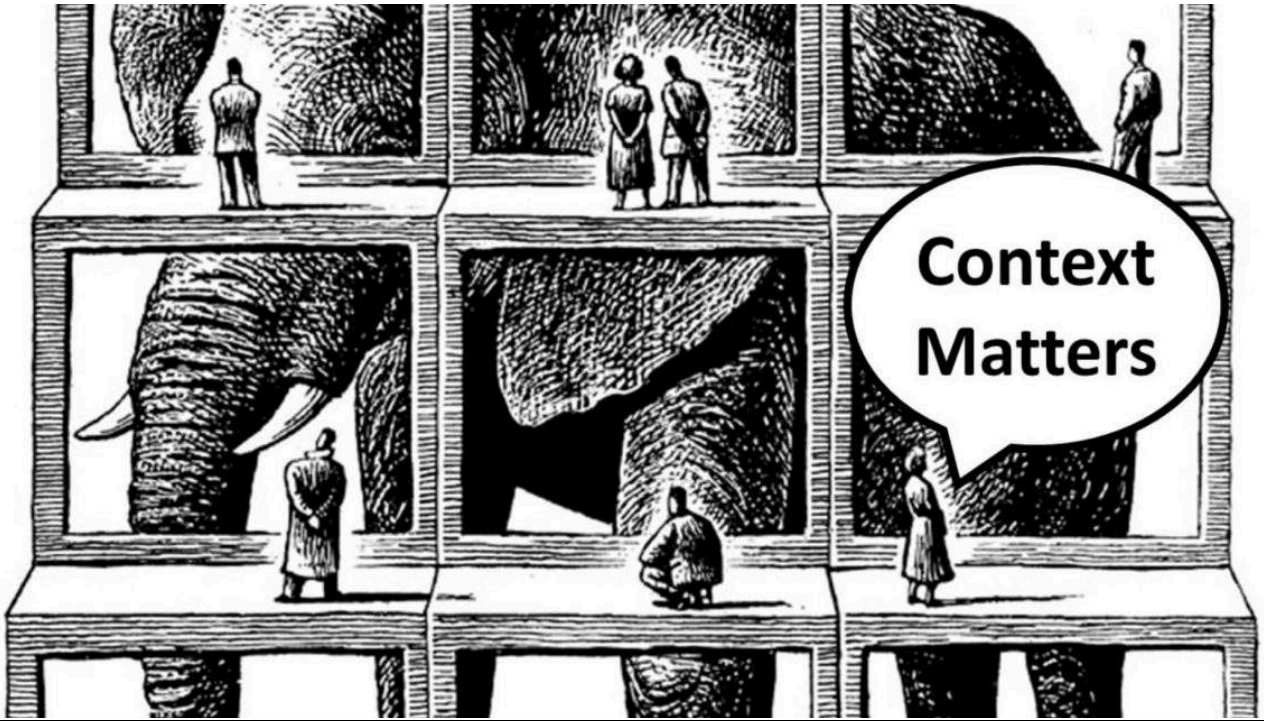
STEM Writing Specialists, Hixon Writing Center

Caltech

(Image Credit)

Topics we'll cover

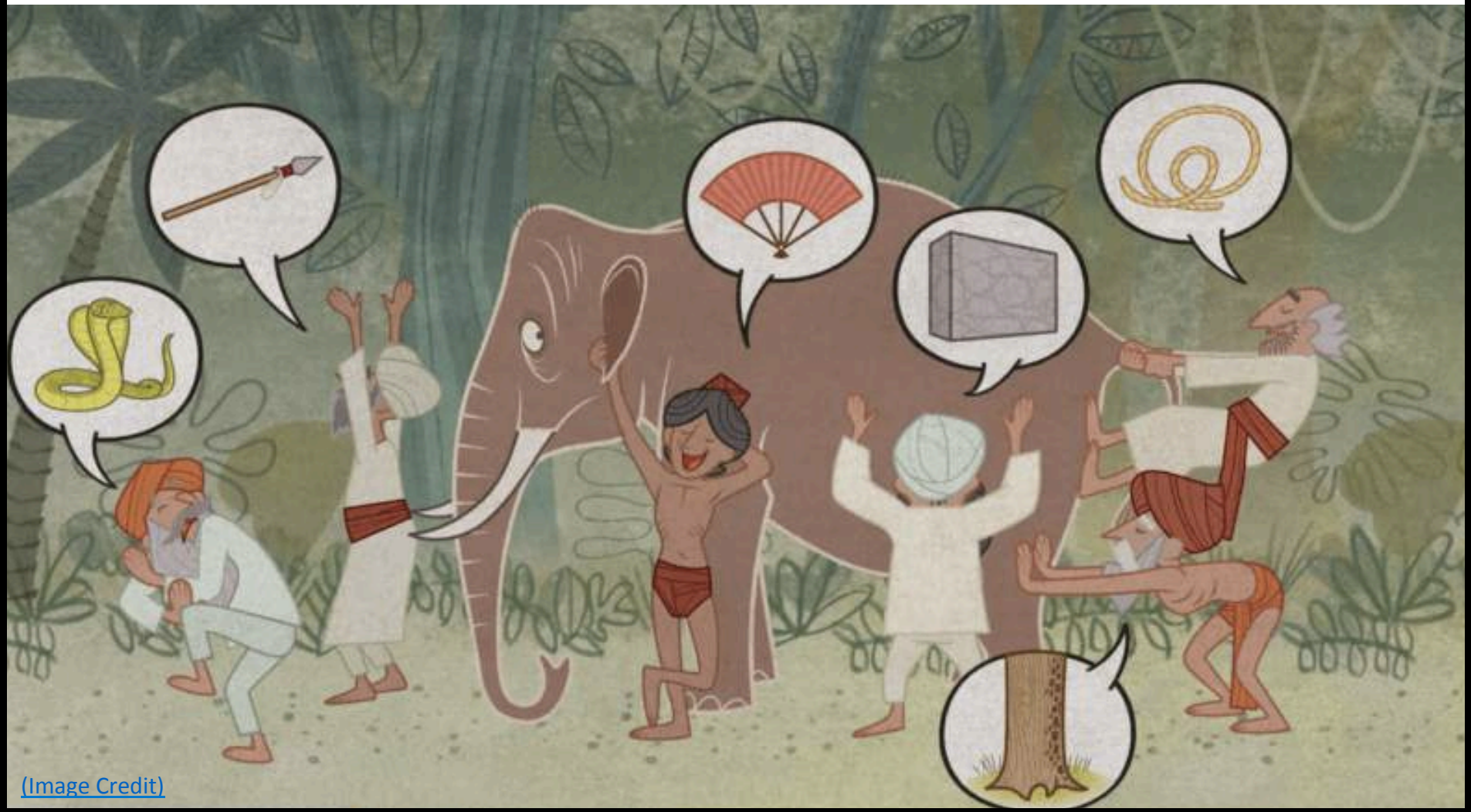
- Contextualization of your research: Why and How
- Experiences learning context: What are yours?
- Activities to help a mentee learn research context
- Benefits to you and mentee



(Image Credit)

The importance of contextualization

Parable of the Blind Men and the Elephant, c.a. 1500-1200 BCE.



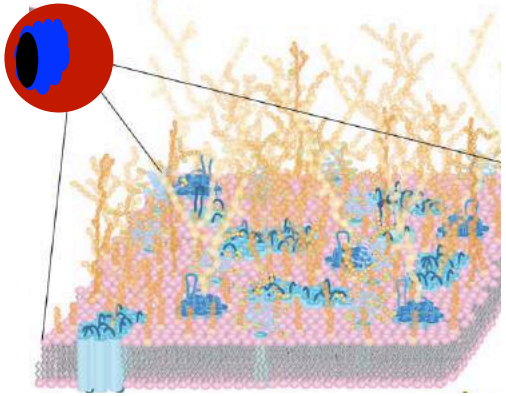
(Image Credit)

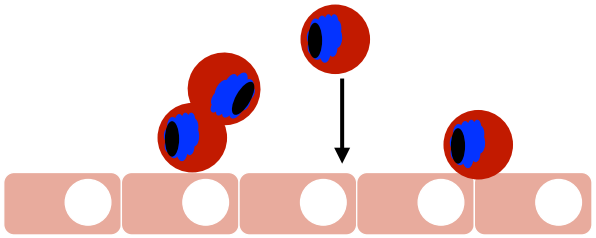
Contextualizing Your Research

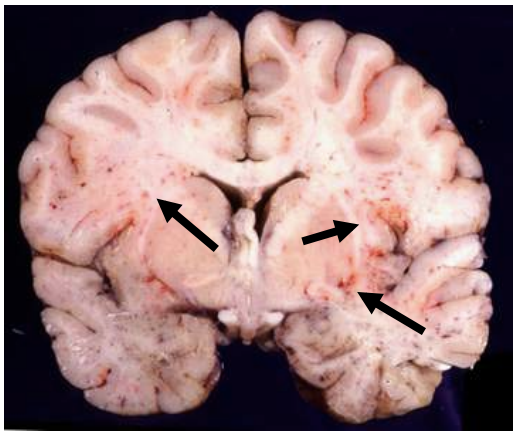
- Being able to see the bigger research landscape and explain how your work relates to it is critical for:
  - Publishing academic papers
  - Engaging peers at conferences
  - Obtaining funding through grants or fellowships
  - Advancing your research career

A Research Project Within the Bigger Picture

My Project: Malaria Proteins	Subfield: Malaria-Host Interactions	Field: Malaria & Public Health
Target and identify surface proteins	Understand malaria adhesion to host cells	Prevent severe malaria caused by cell adhesion
Determine key proteins involved in binding	Disrupt or prevent malaria-infected cells from adhering	Lower death rates from brain hemorrhaging

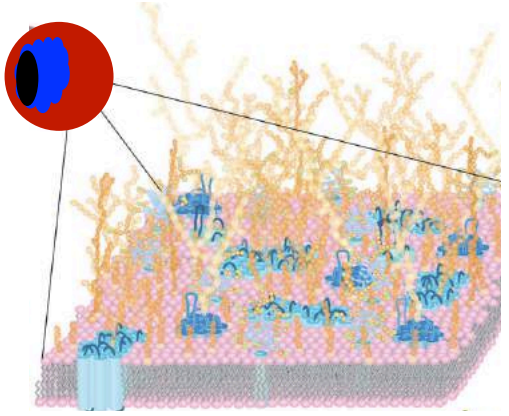






Contextualizing Your Research

- A novice scientist starting work on a project may wonder:
  - “How did we get to this point in the project?”
  - “When did this research start in the lab/field?”
  - “How is this related to other projects?”
  - “What motivated this work?”
  - “Where are we going with this?”



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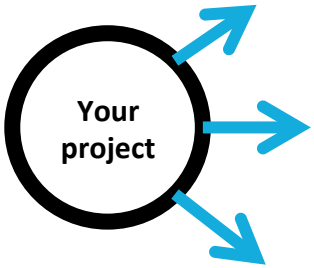
Contextualizing Your Research

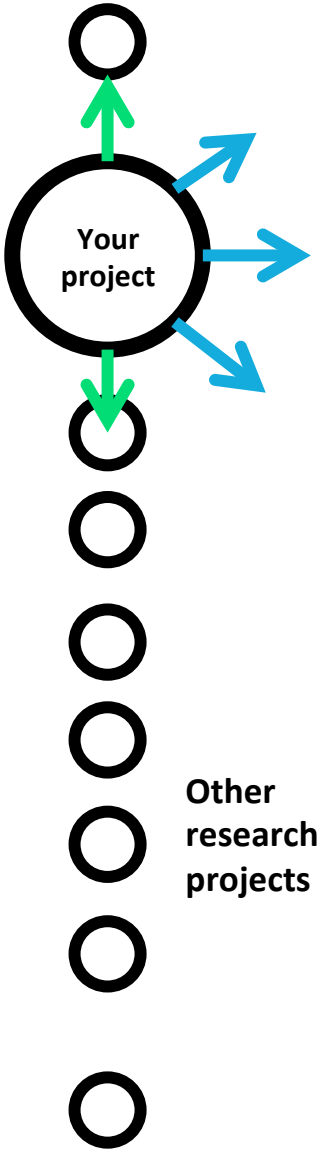
Contextualizing Your Research



You can communicate CONTEXT in terms of:

- **Use: applications & implications**

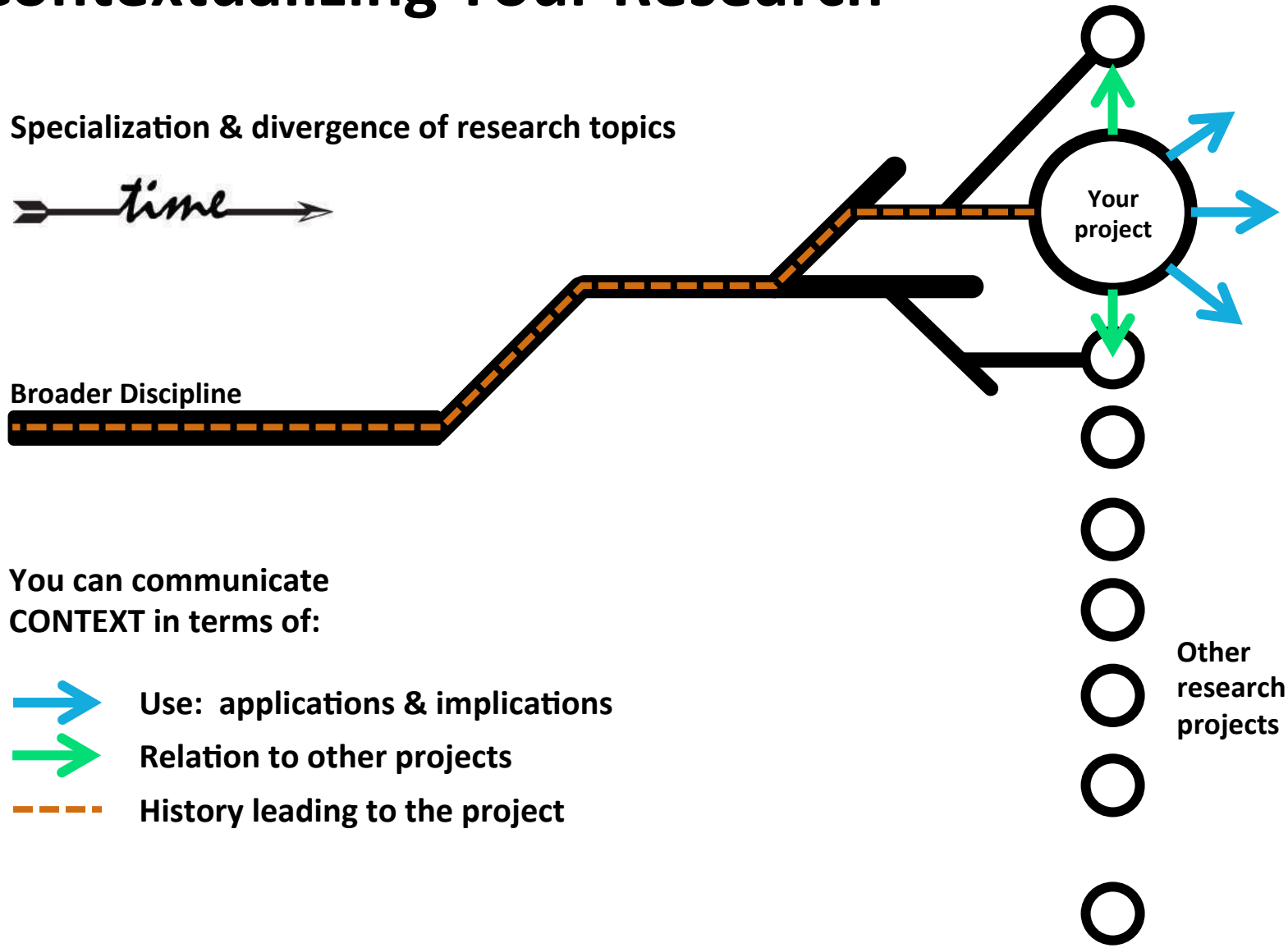
Contextualizing Your Research



You can communicate CONTEXT in terms of:

- **Use: applications & implications**
- **Relation to other projects**

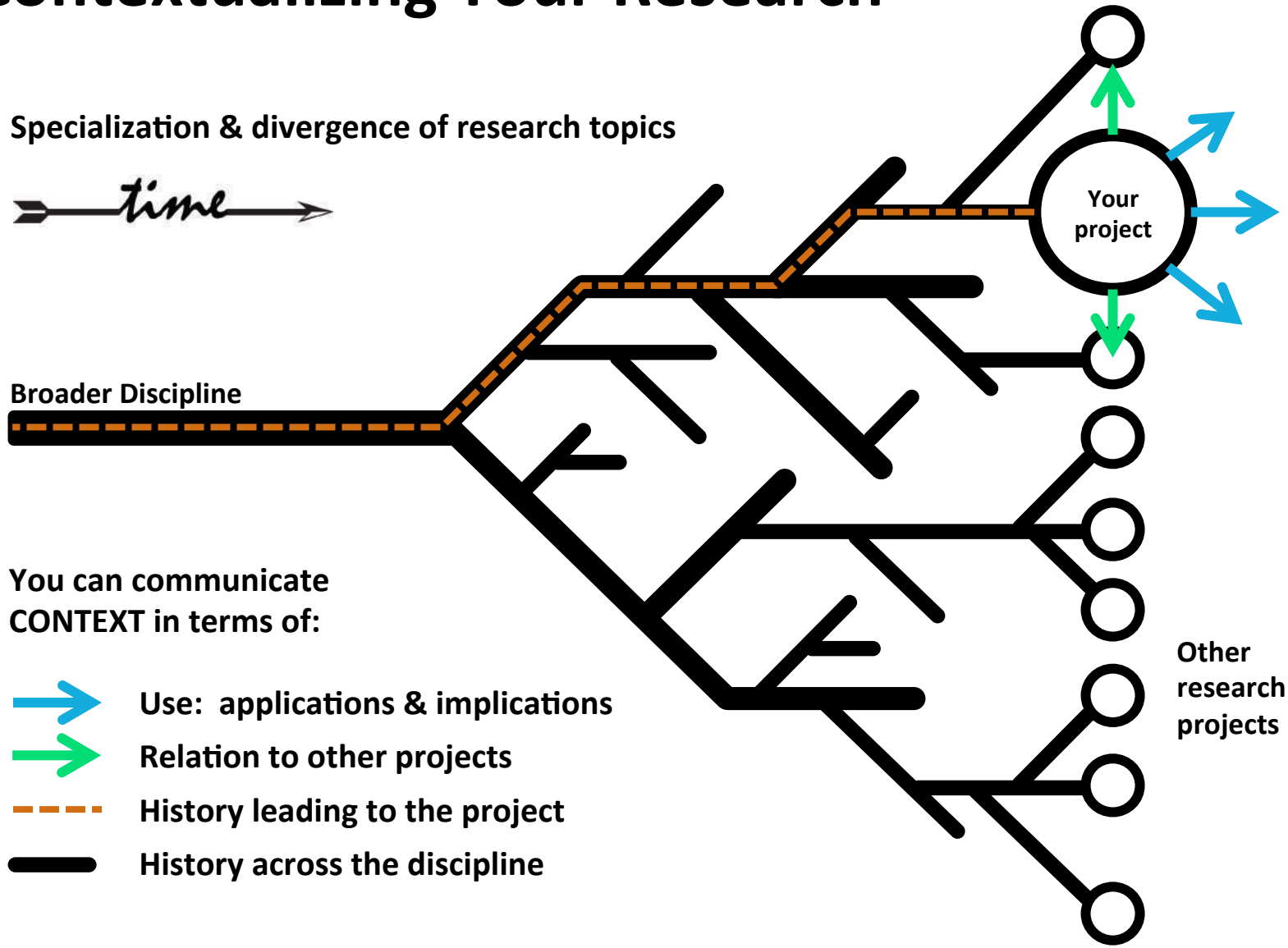
Contextualizing Your Research



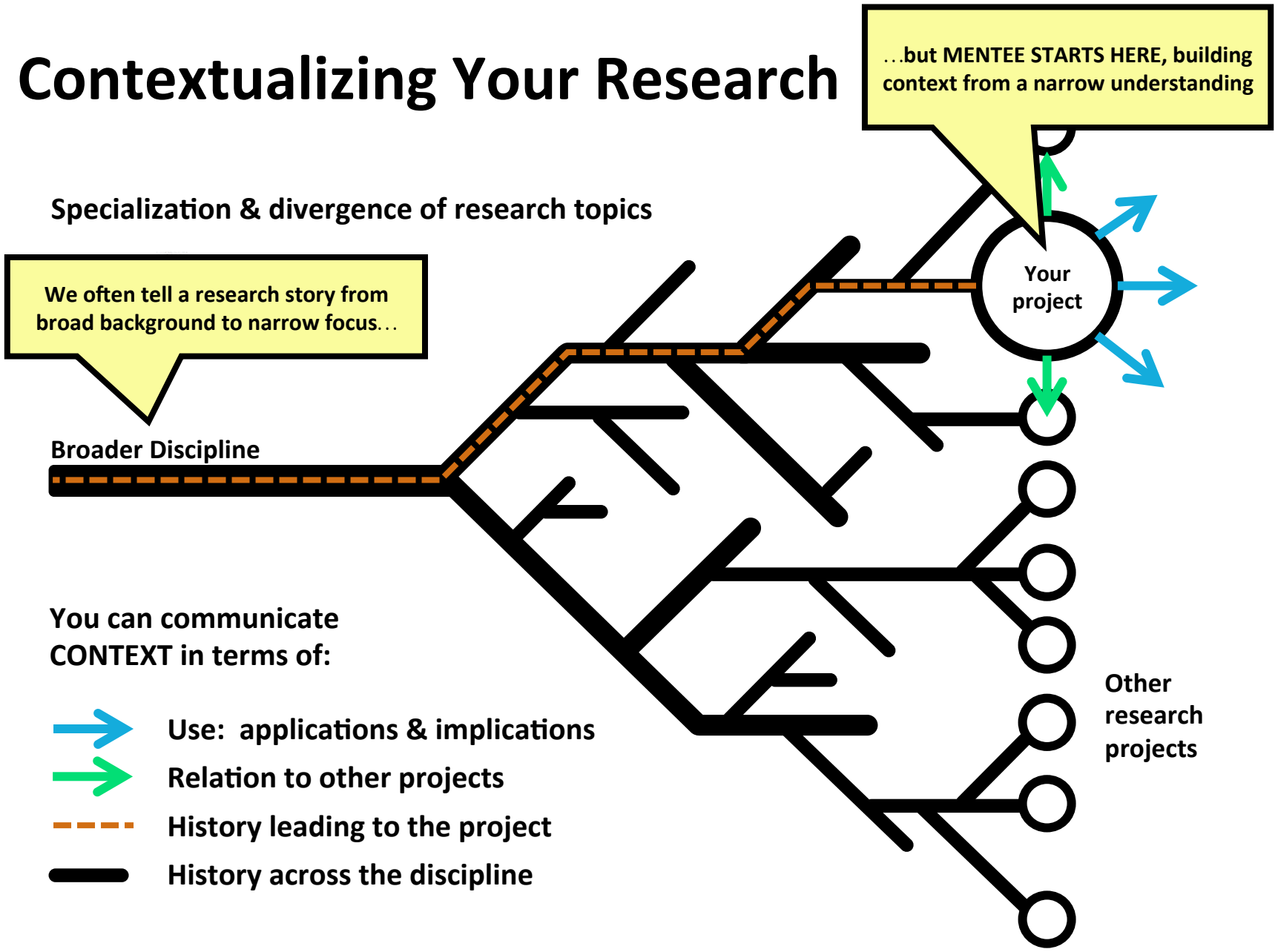
You can communicate
CONTEXT in terms of:

- Use: applications & implications
- Relation to other projects
- History leading to the project

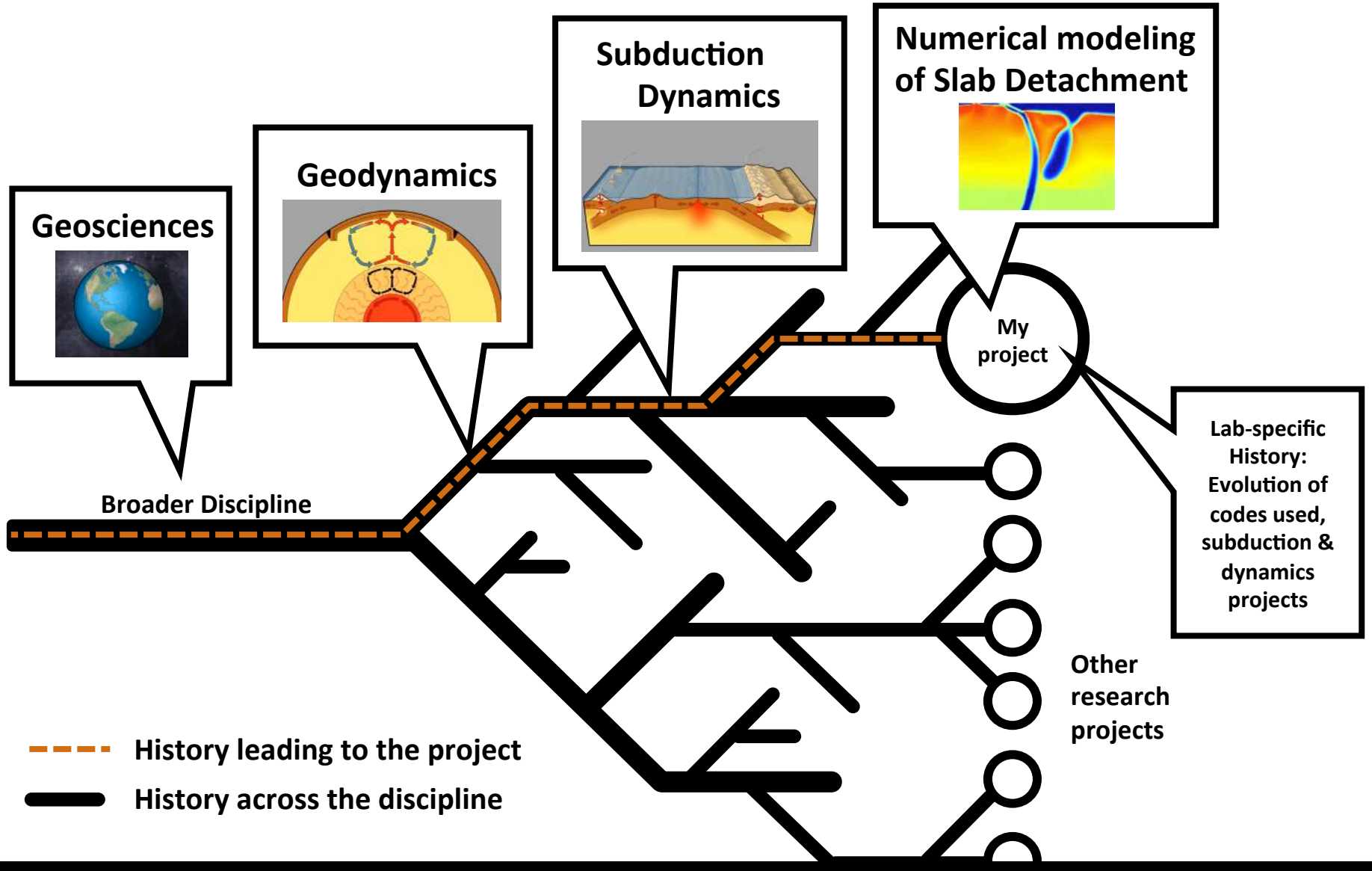
Contextualizing Your Research



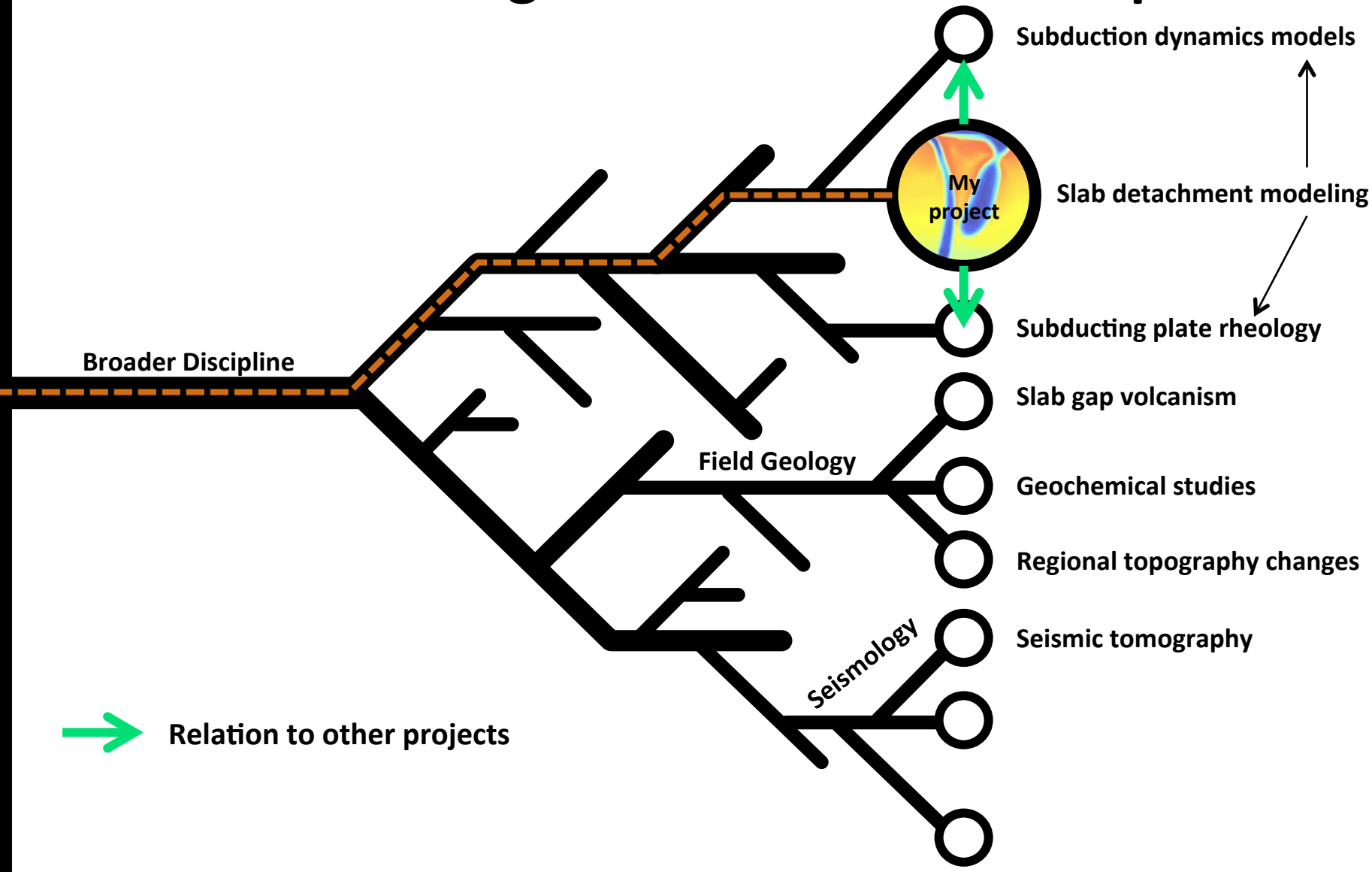
Contextualizing Your Research



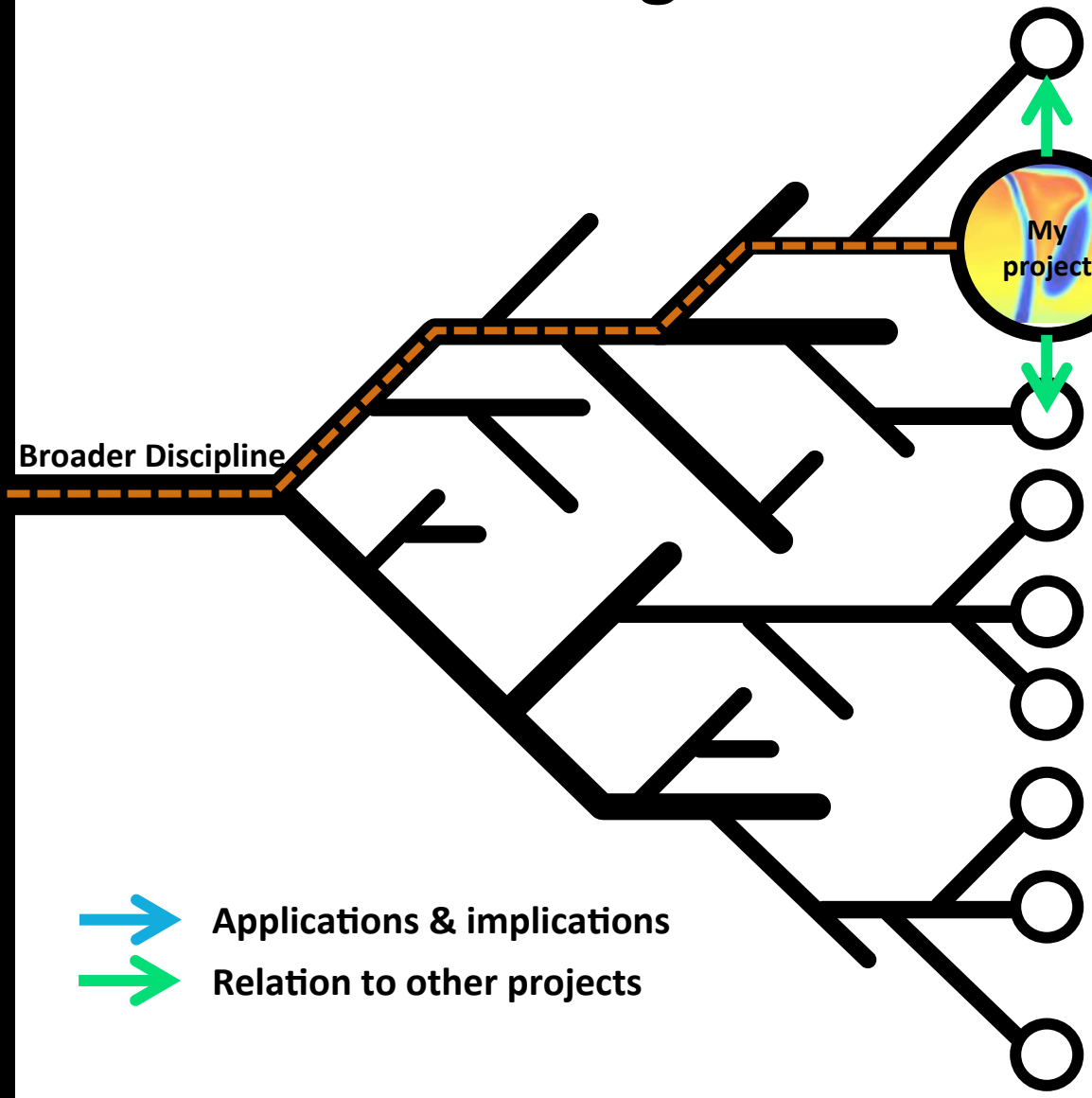
Contextualizing Your Research: Example



Contextualizing Your Research: Example



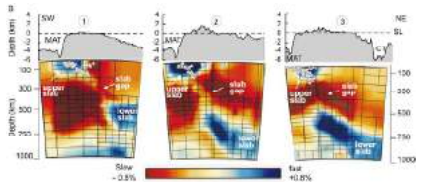
Contextualizing Your Research: Example



Understand possible cause for **changes in tectonic plate motions**

Explain volcanism with a certain unique geochemical signature

Justify tomographic 'x-ray' images of Earth's mantle



N. Central Am. (Rogers et al., 2002)

Applications & implications

Relation to other projects

Contextualization of Research: Benefits

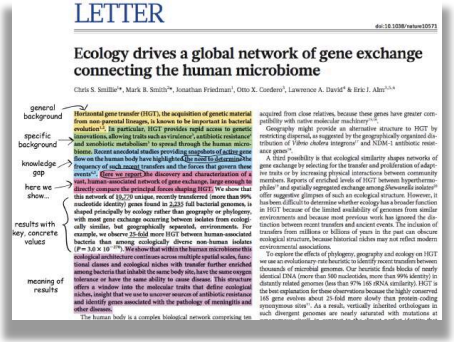
- Helps frame the problem(s) being addressed in terms of the **broader history** or **bigger picture** of the field

- Can help you **identify connections** of your work with other relevant research to cite or discuss (motivation, validation, compare or contrast, similar vs. different methods, etc.).

- **Important in writing** the Introduction or Background section of a paper and addressing elements such as broader significance or wider applications or implications

Teaching context has benefits for you and your mentee

- **Research**
  - Learn about the history of your field
  - Identify related new research quickly
- **Writing**
  - Critique science writing and ideas
  - Gain exposure to multiple forms of science communication
- **Mentoring**
  - Build a professional relationship
  - Assist in a young scientist's learning and development



LETTER

Ecology drives a global network of gene exchange connecting the human microbiome

(Image Credit)

Your Experiences Learning Context?

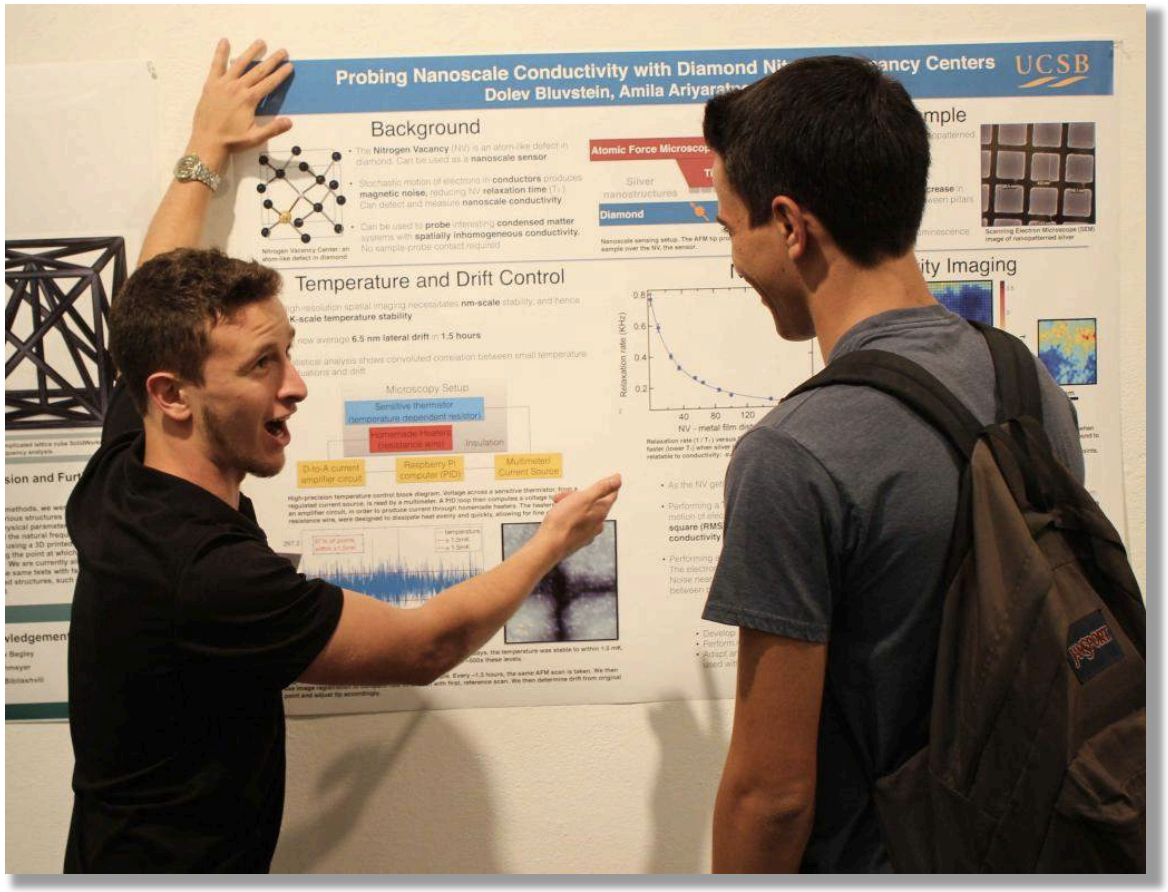
How did you learn the history/context of your field? What have been the most helpful activities for you, whether guided or self-taught?

Share with a partner.

Activities to Teach (and Learn) Research Context

Ideas and their benefits to you and your mentee.

Present your poster to your mentee



Benefit for Mentor:

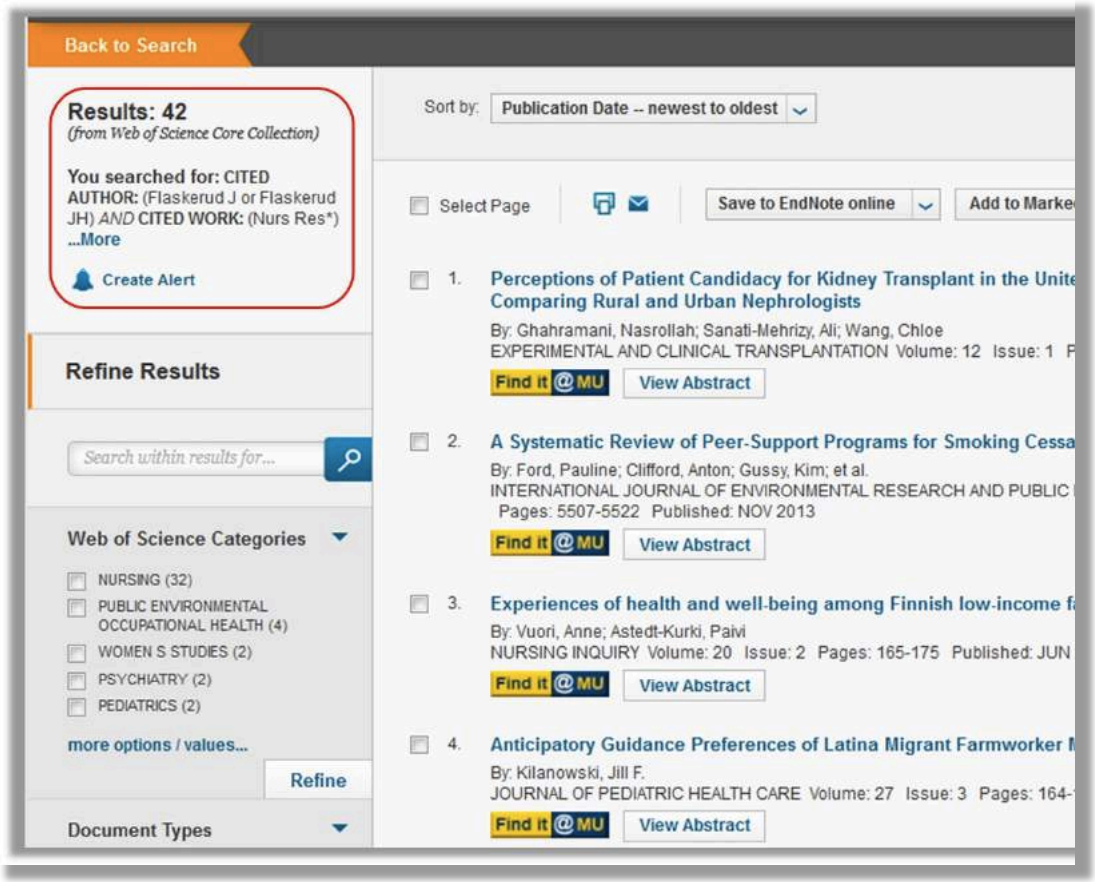
- Challenges you to present to non-expert audience .
- Practice your “30 second research pitch.”

Benefit for Mentee:

- Gets to hear research story told in a succinct way.
- Gains practice interacting with a poster presentation to understand their use.

(Image Source)

Demonstrate How to Perform a Literature Search



Benefit for Mentor:

- Helps you build and expand your knowledge of the research landscape.
- Helps you gain fluency with different journal catalogs.

Benefit for Mentee:

- Learns how to access info independently about lab or field.
- Begins to see patterns across the field; learns key words.

(Image Source)

Assign Your Mentee to Interview Other Members of Your Group

Benefit for Mentor:

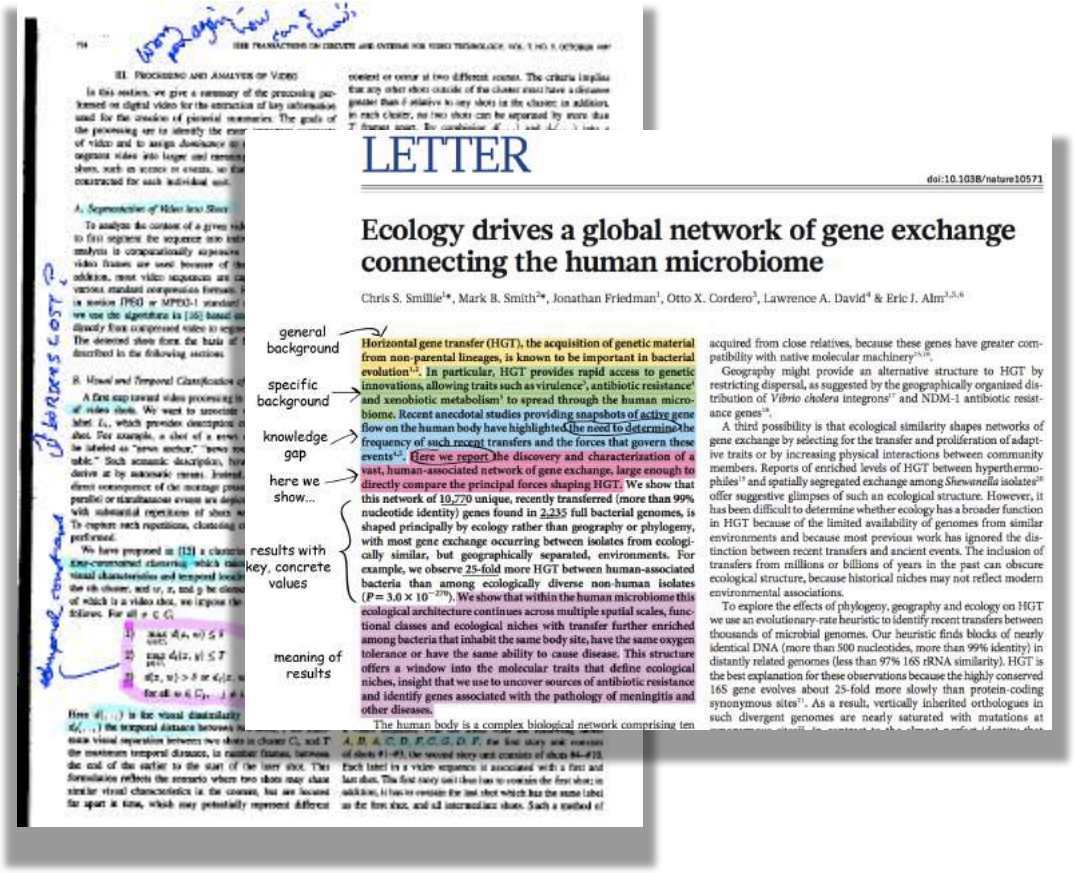
- May help renew or refresh relationships across the lab or with collaborators.
- Opportunity to review mentee's writing (e.g. summary of interviews)

Benefit for Mentee:

- Creates structured opportunity for them to meet others in the lab.
- Practices writing about research in low-stakes environment (e.g. interview notes).

(Image Source)

Assign Articles to Read (and Discuss Research with Your Mentee)



Benefit for Mentor:

- Helps you stay up-to-date with the field.
- Gives you practice reading and critiquing research, and anticipating your mentee's questions.

Benefit for Mentee:

- Gains valuable experience reading, critiquing, and summarizing work relevant to their project.
- Opportunity for one-to-one questions and discussion.

(Image Source)

Attend a Research Seminar Together

Benefit for Mentor:

- Stay up to date on research; networking.
- View new presenting styles to add to your communication toolbox.

Benefit for Mentee:

- Exposed to cutting-edge research.
- Learns how scientists evaluate the work of their peers through dialogue.

(Image Source)

Teach a Series of Brief "Lessons" on Key Topics to Your Mentee

Benefit for Mentor:

- Opportunity to master the material through teaching.
- Practice thinking about curriculum design; exposure to teaching practices.

Benefit for Mentee:

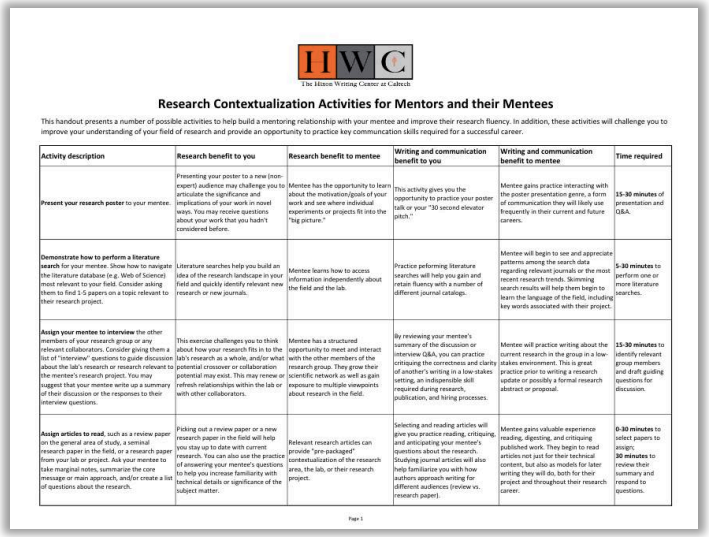
- Gains large amount of relevant knowledge quickly.
- Learns how to present technical information in a logical way, using a variety of writing genres.

(Image Source, Source)

Other Activity Ideas for Building Context?

- Any other ideas to add?
  - Benefits for you?
  - Benefits for your mentee?

- Add any noteworthy ideas to the “Other” row in the spreadsheet we will hand out.



IIWC
The Hixon Writing Center at Caltech

Research Contextualization Activities for Mentors and their Mentees

This handout presents a number of possible activities to help build a mentoring relationship with your mentee and improve their research fluency. In addition, these activities will challenge you to improve your understanding of your field of research and provide an opportunity to practice key communcation skills required for a successful career.

Activity description	Research benefit to you	Research benefit to mentee	Writing and communication benefit to you	Writing and communication benefit to mentee	Time required
Present your research poster to your mentee.	Presenting your poster to a new (non-expert) audience may challenge you to articulate the significance and implications of your work in novel ways. You may receive questions about your work that you hadn't considered before.	Mentee has the opportunity to learn about the motivation/goals of your work and see where individual experiments or projects fit into the "big picture."	This activity gives you the opportunity to practice your poster talk or your "30 second elevator pitch."	Mentee gains practice interacting with the poster presentation genre, a form of communication they will likely use frequently in their current and future careers.	**15-30 minutes** of presentation and Q&A.
Demonstrate how to perform a literature search for your mentee. Show how to navigate the literature database (e.g. Web of Science) most relevant to your field. Consider asking them to find 1-5 papers on a topic relevant to their research project.	Literature searches help you build an idea of the research landscape in your field and quickly identify relevant new research or new journals.	Mentee learns how to access information independently about the field and the lab.	Practice peforming literature searches will help you gain and retain fluency with a number of different journal catalogs.	Mentee will begin to see and appreciate patterns among the search data regarding relevant journals or the most recent research trends. Skimming search results will help them begin to learn the language of the field, including key words associated with their project.	**5-30 minutes** to perform one or more literature searches.
Assign your mentee to interview the other members of your research group or any relevant collaborators. Consider giving them a list of "interview" questions to guide discussion about the lab's research or research relevant to the mentee's research project. You may suggest that your mentee write up a summary of their discussion or the responses to their interview questions.	This exercise challenges you to think about how your research fits in to the lab's research as a whole, and/or what potential crossover or collaboration potential may exist. This may renew or refresh relationships within the lab or with other collaborators.	Mentee has a structured opportunity to meet and interact with the other members of the research group. They grow their scientific network as well as gain exposure to multiple viewpoints about research in the field.	By reviewing your mentee's summary of the discussion or interview Q&A, you can practice critiquing the correctness and clarity of another's writing in a low-stakes setting, an indispensible skill required during research, publication, and hiring processes.	Mentee will practice writing about the current research in the group in a low-stakes environment. This is great practice prior to writing a research update or possibly a formal research abstract or proposal.	**15-30 minutes** to identify relevant group members and draft guiding questions for discussion.
Assign articles to read, such as a review paper on the general area of study, a seminal research paper in the field, or a research paper from your lab or project. Ask your mentee to take marginal notes, summarize the core message or main approach, and/or create a list of questions about the research.	Picking out a review paper or a new research paper in the field will help you stay up to date with current research. You can also use the practice of answering your mentee's questions to help you increase familiarity with technical details or significance of the subject matter.	Relevant research articles can provide "pre-packaged" contextualization of the research area, the lab, or their research project.	Selecting and reading articles will give you practice reading, critiquing, and anticipating your mentee's questions about the research. Studying journal articles will also help familiarize you with how authors approach writing for different audiences (review vs. research paper).	Mentee gains valuable experience reading, digesting, and critiquing published work. They begin to read articles not just for their technical content, but also as models for later writing they will do, both for their project and throughout their research career.	**0-30 minutes** to select papers to assign; **30 minutes** to review their summary and respond to questions.

Page 1

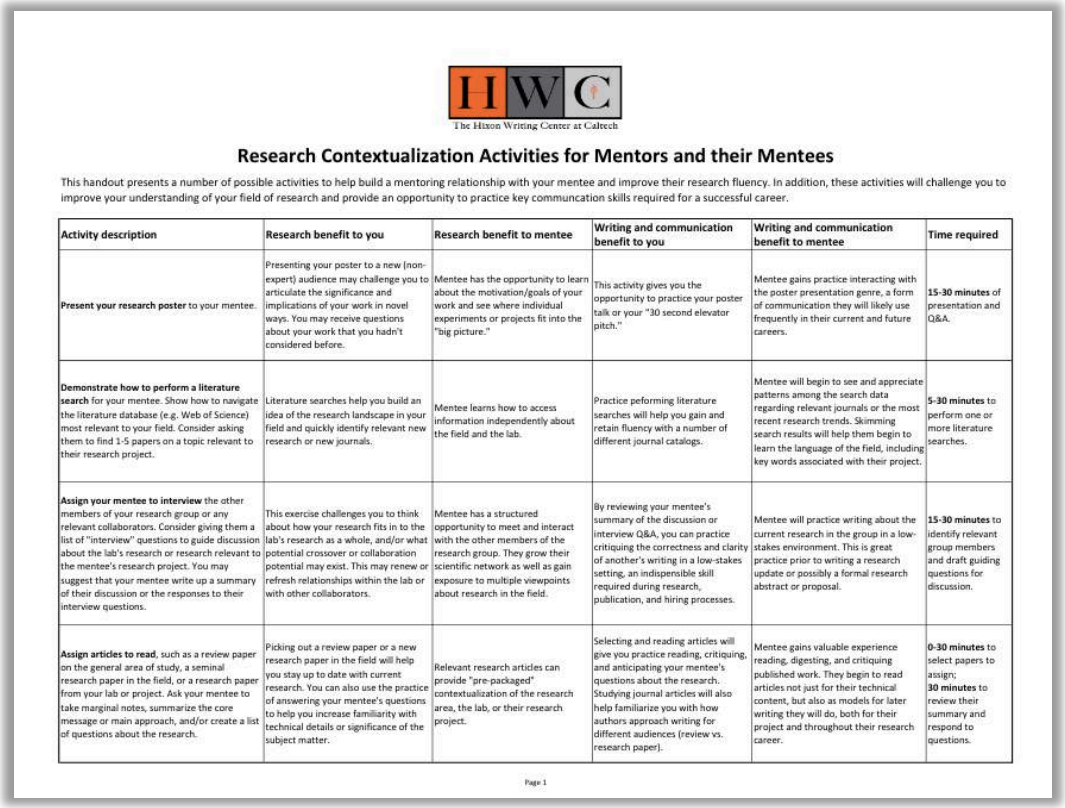
Challenges & Cautions

- **Beware of assigning too much reading**. Although an easier option, not all learn well through reading alone, and there is an unproductive overload point.

- **Nurture awareness** of when zoomed in on details when it may help a mentee to back up and give the larger context.

- With 'Expert amnesia'/'Curse of Knowledge' you might rely on internalized understanding that you mentee may not yet have, so **encourage and give time for questions**.

Try it out!



HWC
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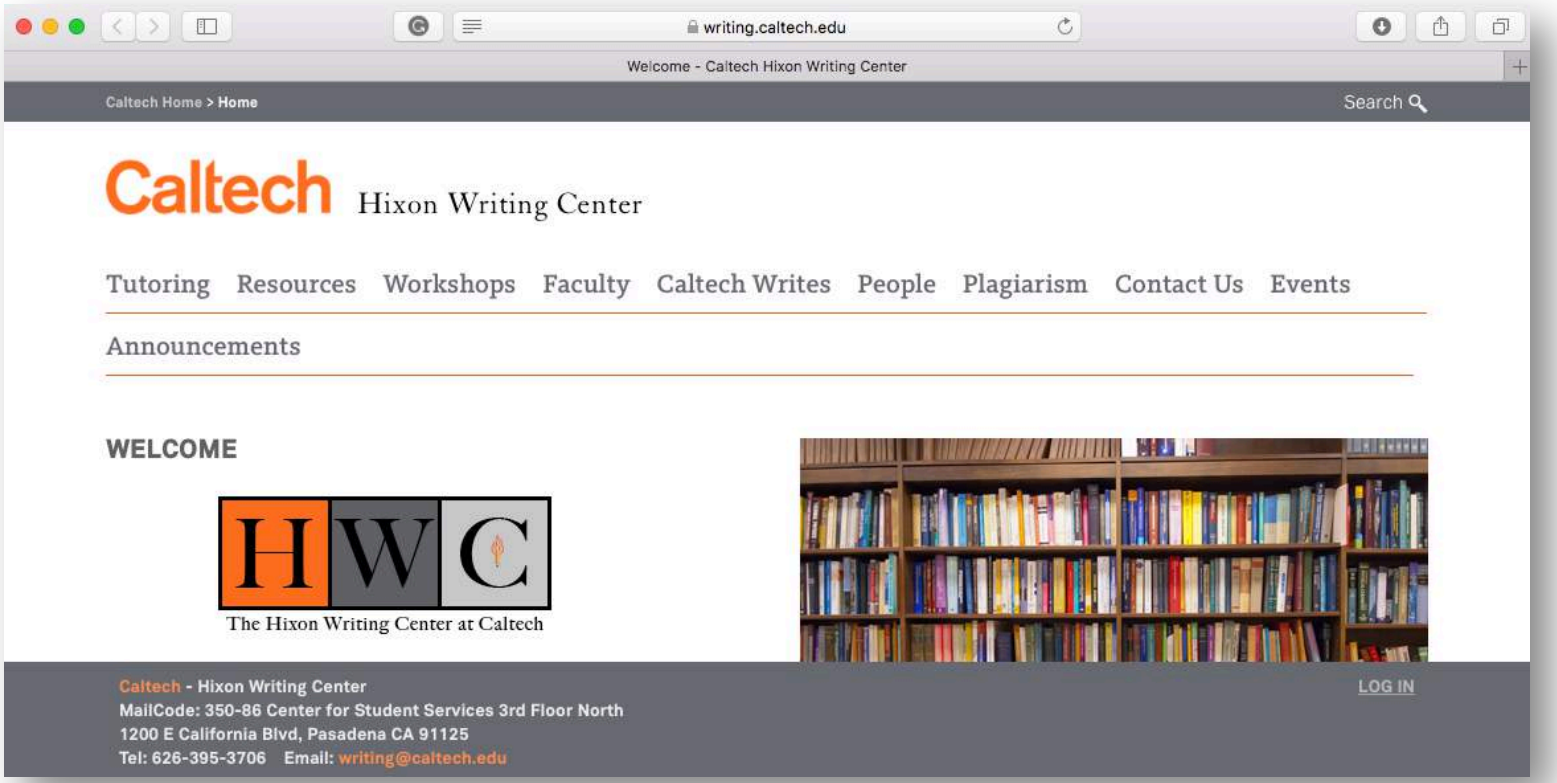
Page 1

We encourage you to choose two activities to try with your mentee this summer! Email us if you have questions, comments, or want to tell us how it went.

birch@caltech.edu erb@caltech.edu

Writing Center Resources



Online & Tutoring Resources: writing.caltech.edu

birch@caltech.edu erb@caltech.edu