

Essential Skills Needed for a PhD Student

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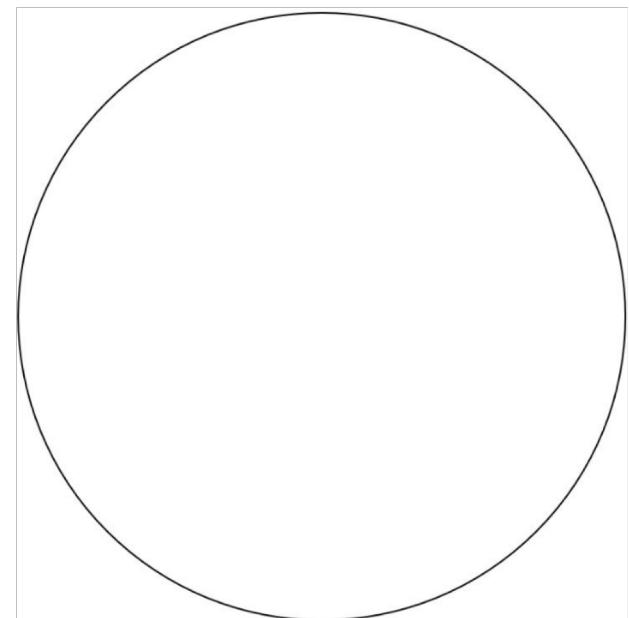
What is a PhD?

**5 more years of
new knowledge**



What is a PhD?

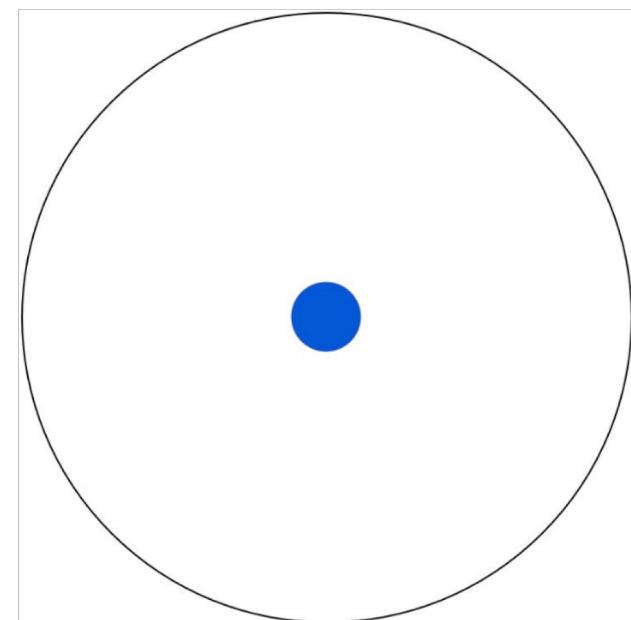
Imagine a **circle** that contains
all of human knowledge



From <http://matt.might.net/articles/phd-school-in-pictures/>

What is a PhD?

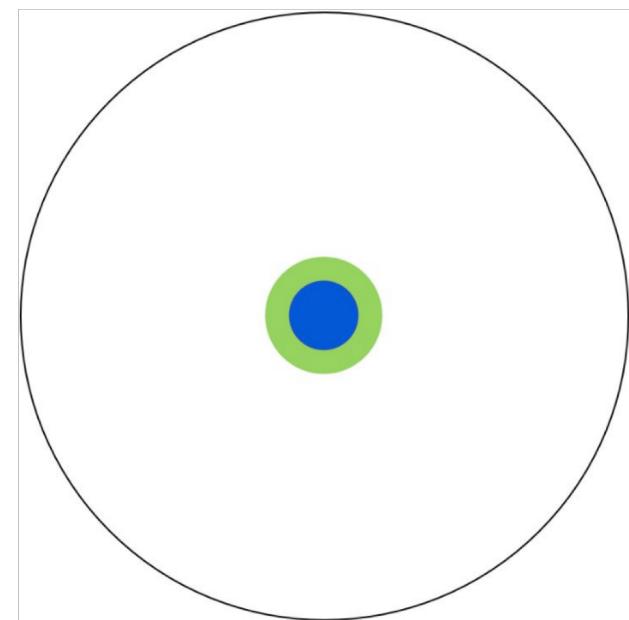
By the time you finish
elementary school,
you know a little.



From <http://matt.might.net/articles/phd-school-in-pictures/>

What is a PhD?

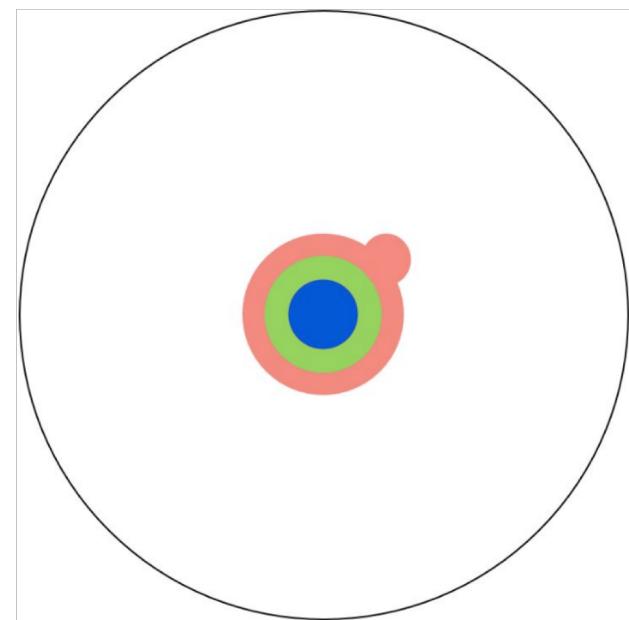
By the time you finish
high school,
you know a bit more



From <http://matt.might.net/articles/phd-school-in-pictures/>

What is a PhD?

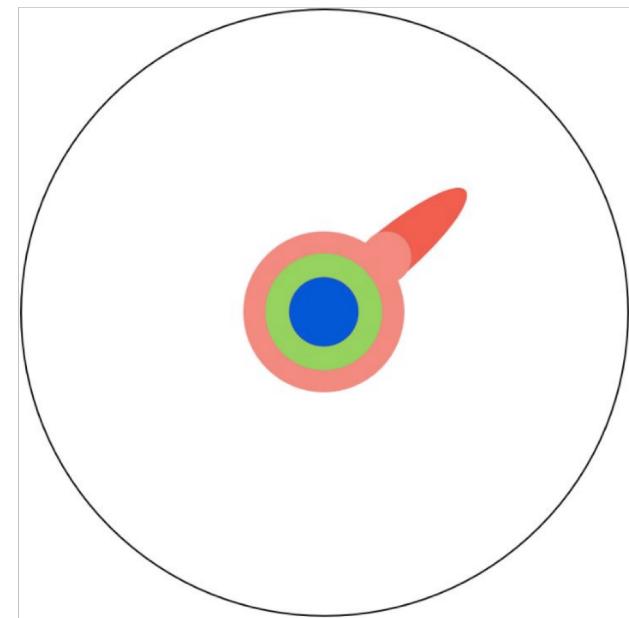
With a **bachelor's degree**,
you gain a specialty.



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What is a PhD?

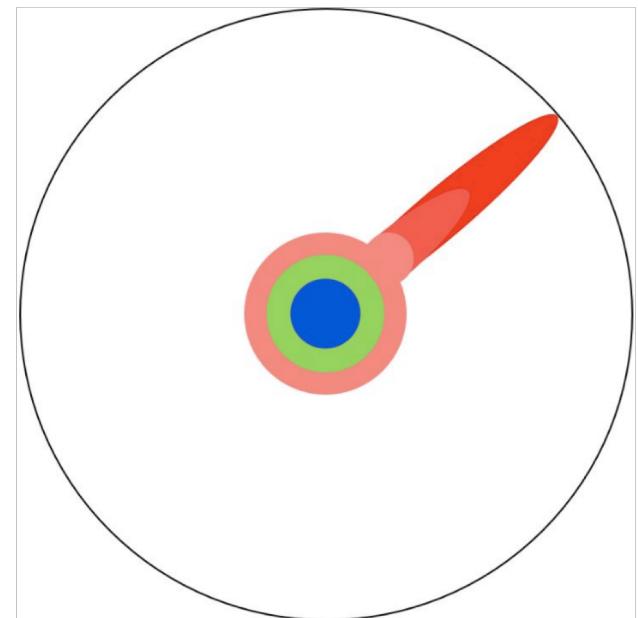
A **master's degree**
deepens that specialty.



From <http://matt.might.net/articles/phd-school-in-pictures/>

What is a PhD?

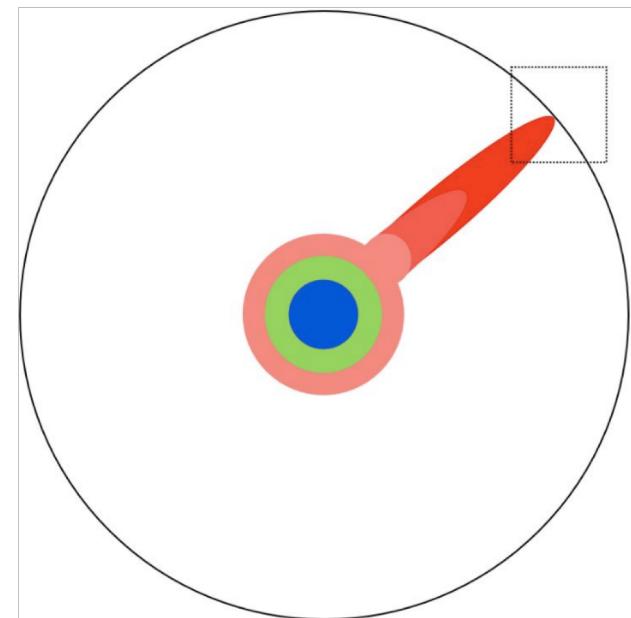
Reading papers takes you
to the edge of human knowledge.



From <http://matt.might.net/articles/phd-school-in-pictures/>

What is a PhD?

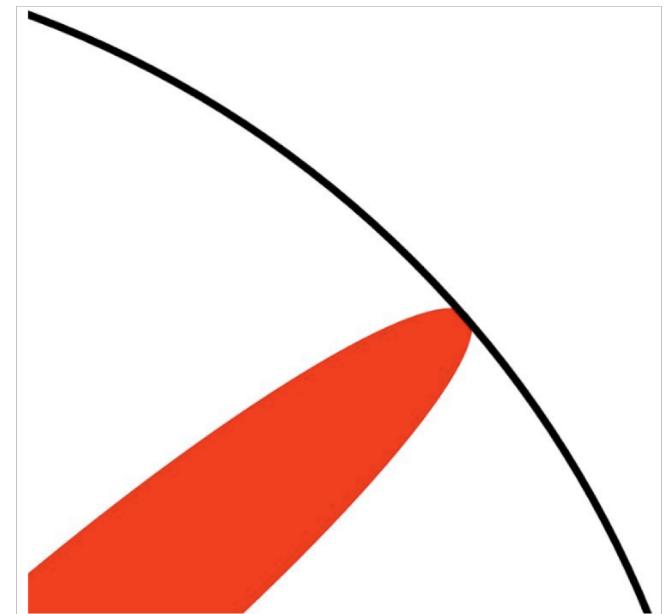
Once you're at the boundary,
you **focus**.



From <http://matt.might.net/articles/phd-school-in-pictures/>

What is a PhD?

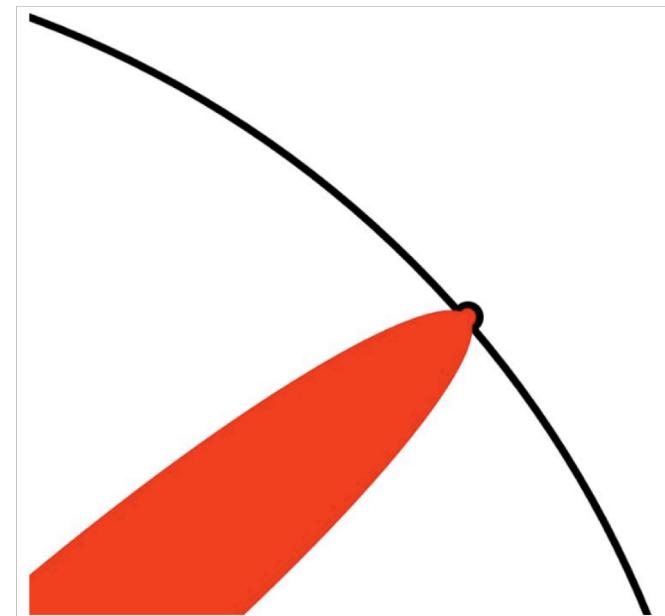
You **push at the boundary**
for a few years.



From <http://matt.might.net/articles/phd-school-in-pictures/>

What is a PhD?

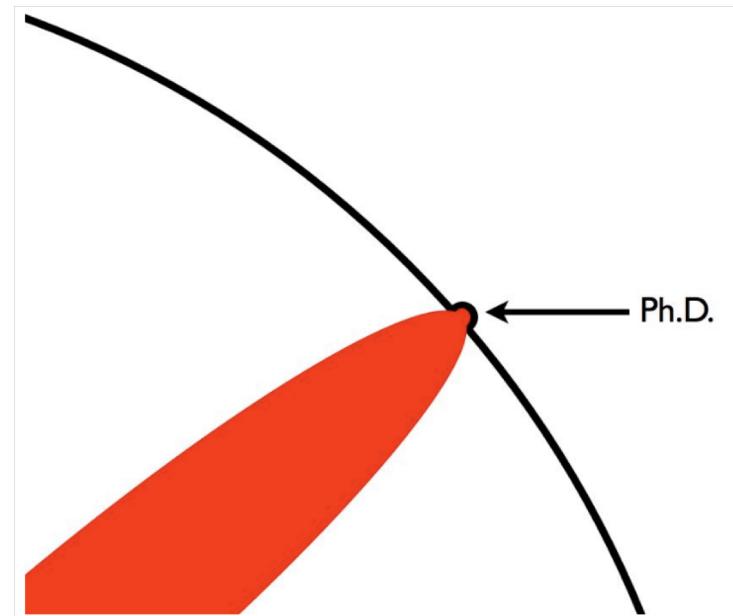
Until one day, **the boundary gives way.**



From <http://matt.might.net/articles/phd-school-in-pictures/>

What is a PhD?

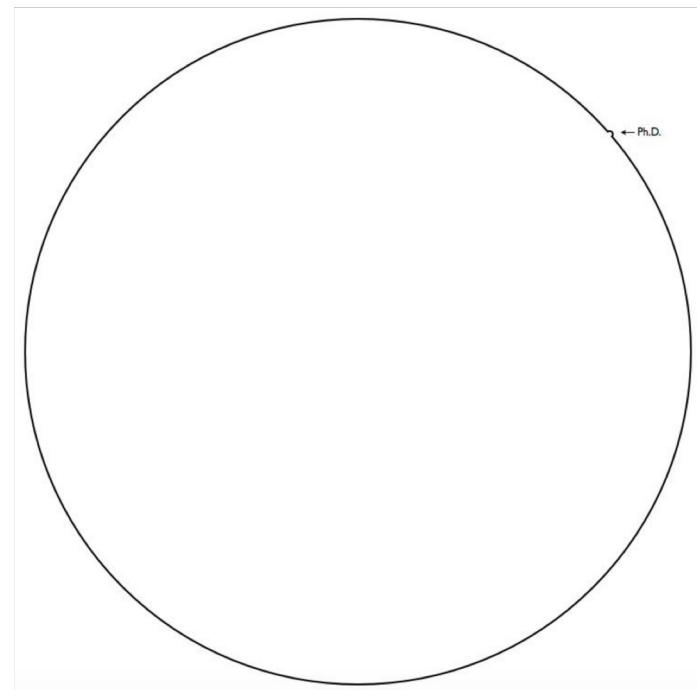
And, that **dent** you've made is
called a **Ph.D.**



From <http://matt.might.net/articles/phd-school-in-pictures/>

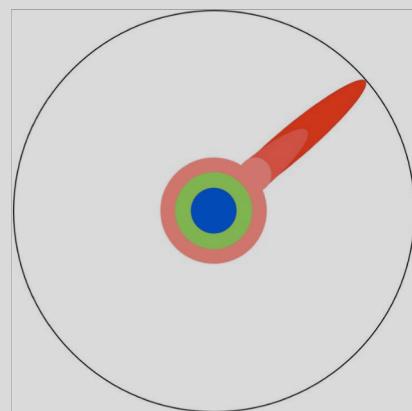
What is a PhD?

Thanks to your contribution!



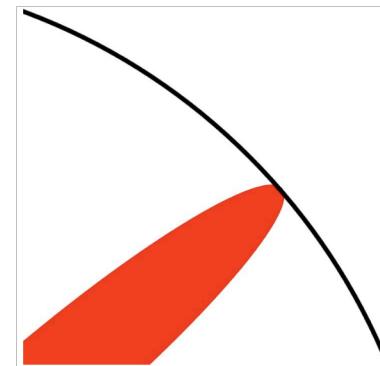
Essential Skills

Reading Papers



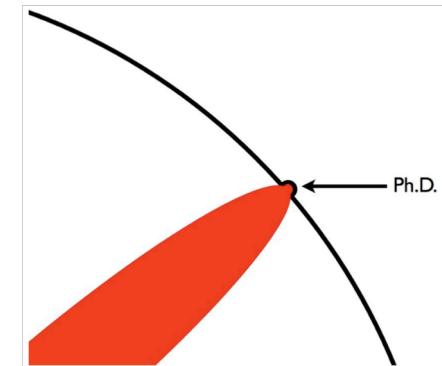
Critical Thinking

- Reviewing Papers
- Asking Questions
- ...



Presentation

- Giving Talks
- ...



Reading Papers

Top conferences/journals

- E.g., Database: SIGMOD, VLDB, TODS, ...
- E.g., Machine Learning: NIPS, ICML, JMLR, ...

The three-pass approach*

1. A quick scan
2. With greater care, but ignore details
3. Virtually re-implement the paper

* S. Keshav. How to read a paper? <http://blizzard.cs.uwaterloo.ca/keshav/home/Papers/data/07/paper-reading.pdf>

The First Pass

“A quick scan” means that:

- Carefully read the **Title, Abstract, Introduction, Section headings, Conclusion**
- Glance over the mathematical content (if any) and the references

You should be able to answer:

- What's the **motivation** of the paper?
- What's the **key idea** of the paper?
- What can be learnt from the paper?

The Second Pass

“With greater care, but ignore details” means that:

- Look carefully at the **figures, diagrams and examples**
- Mark relevant unread references for further reading
- Ignore proofs, extensions, and appendix

You should be able to

- Summarize the content of the paper
- Explain the main objective of the paper, with supporting evidence, **to somebody else**

The Third Pass

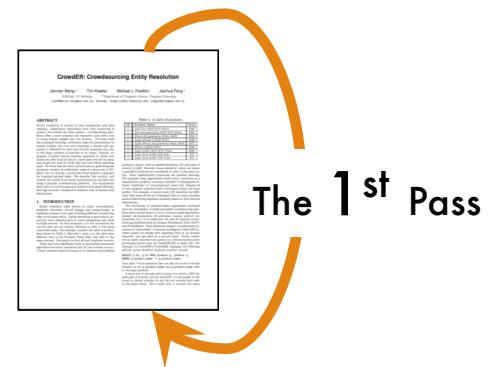
“*Virtually re-implement the paper*” means that

- Challenge every assumption
- Think about how you yourself would present a particular idea
- Compare this re-creation with the actual paper

You should be able to

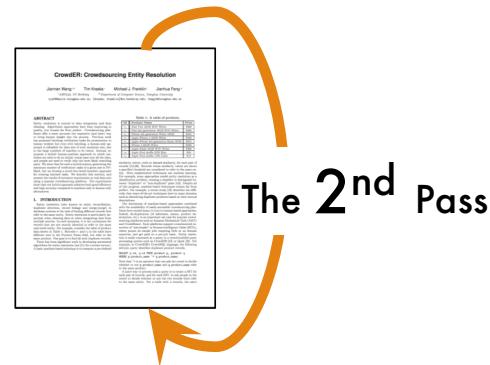
- Identify hidden failings and assumptions
- Derive new ideas for future work

When to use which



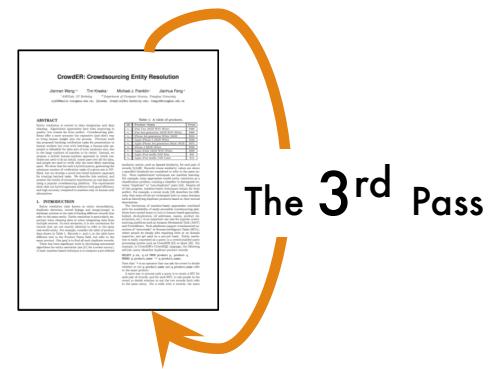
**Stop here if
not interesting**

When to use which



**Stop here if not useful to
your work**

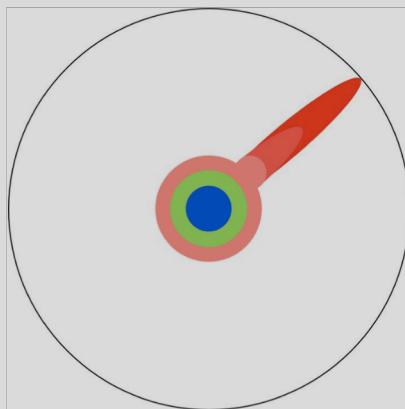
When to use which



Fully understand the
paper

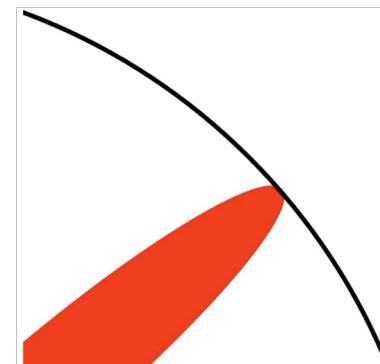
Essential Skills

Reading Papers



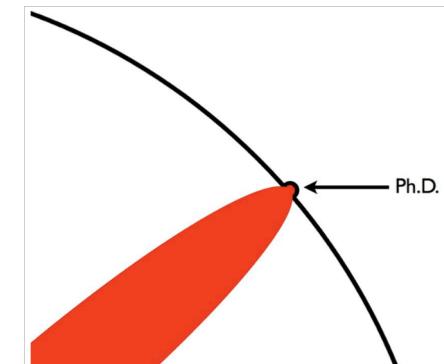
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- Giving Talks
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Why Paper Review

The Peer Review Process

What's a review for?

- **Quality Control:** Publish or not?
- **Constructive Criticism:** How to improve?



Structure of a Review

1. Summarize the paper (1-2 paras)
2. State the contributions (1 para)
3. Strong/Weak Points (in bullet form, 3+ for each)
4. Detailed Comments (as long as necessary)
 - Novelty, Presentation, Significance, Technical Depth, Related Work
 - Technical flaws? Unaddressed issues? Appropriate for the venue?

Timothy Roscoe. [Writing reviews for systems conferences](#). March 2007

Advice on writing reviews

Take notes while reading the paper

Make the review constructive

- The system doesn't deal with ... → The paper would be much stronger if ...

Criticize the paper, not the authors or the work itself

- You should cite [1] → The paper reminded me of [1], which seems quite similar

Avoid flat assertions

- The algorithm breaks when $n=1$ → The description in the paper left me worried that the algorithm breaks when $n=1$. For example, suppose ...

Asking Questions at Talks

Why to ask?

- Force you to listen to a talk more carefully
- A great opportunity to talk directly with a big guy
- Train your public speaking skills
- You will be remembered if asking a great question
- Show respect to a speaker

Guidance

What to ask?

- Asking Questions ≈ Online Paper Review
- Critical Thinking*

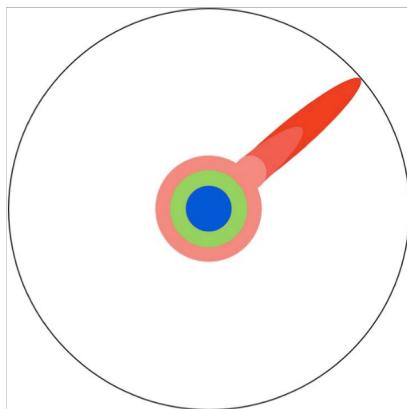
How to ask?

- Be clear about what you want to know
- Provide context if necessary
- Challenge the speaker in a constructive way

* M. Neil Browne and Stuart M. Keeley. [Asking the Right Questions](#)

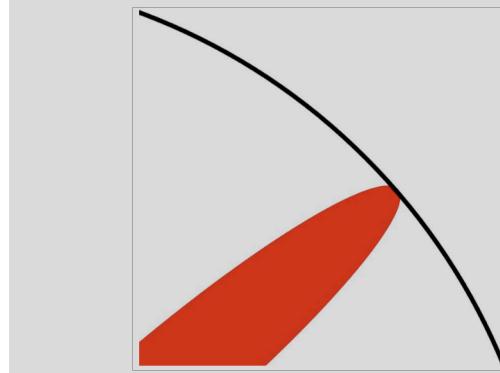
Essential Skills

Reading Papers



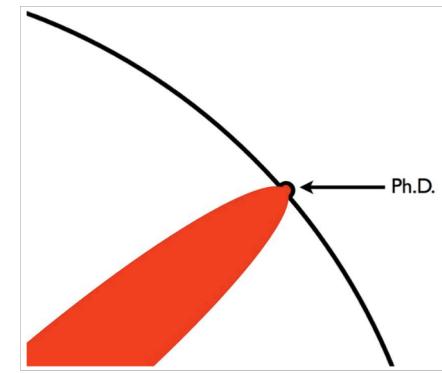
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Plenty of Opportunities

Give a talk in a conference

Give a talk in class

Give a talk in a meeting with your advisor

Give a talk in a group meeting

Give a talk in PhD Depth Exam

Give a talk in PhD Thesis Defense

Why giving a talk?

Communication

Convey **complex** information in a **simple** way

Excite and motivate the **audience**

How to prepare a talk?

Step 1: Come up with a message objective

Step 2: Come up with no more than 3 points in support of your message objective

Step 3: Determine the evidence to support each point

Step 4: Determine your hook

Step 5: Determine your wrap-up

Joey Asher. [Even a Geek Can Speak: Low-tech Presentation Skills for High-tech People.](#) 2006

Steps in Preparing a Talk - 1

Step 1: Come up with a Message Objective

Why? Never hear again: "I'm not sure what your point is"

How? Bring together **what you want** with **what the audience wants**

Example: By **mastering the essential skills**, students will have a higher chance to **become a successful PhD**

Steps in Preparing a Talk - 2

Step 2: Come up with no more than 3 points in support of your message objective

Why? People cannot remember more than 3 points. Fewer points have more impact

How? Keep the most important points

Example: (Point 1) What is a PhD?

(Point 2) What are essential skills for a PhD?

(Point 3) How to master the skills

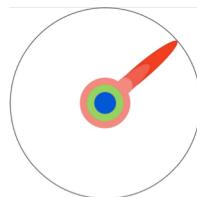
Steps in Preparing a Talk - 3

Step 3: Determine the evidence to support each point

This step is the key to make your presentation exciting

How? Examples, Analogies, Stories, Personal experiences, Quotes, Statistics

Example: Using



to explain what a PhD is

Steps in Preparing a Talk - 4

Step 4: Determine your hook

The Hook: Make a first impression with impact

A great hook should

- Grab the audience's attention
- Focus the audience immediately on the key issues
- Be short and fast

Example: PhD is just 5 more years of learning new knowledge?



Steps in Preparing a Talk - 5

Step 5: Determine your wrap-up

Why? Make absolutely sure that the audience has gotten your key message

How?

- Restate your message objective and your key points
- Call to action: what you want the audience to do next

Example. See [Slide 38.](#)

Fill in the Form for Your Talk

Hook:

Message Objective:

Key Points Along With Their Evidence

- Point 1:
- Evidence:
- Point 2:
- ...

Recap and Wrap:

Summary

Objective: By mastering the essential skills, students will have a higher chance to become a successful PhD

1. What is a PHD? Creating new knowledge

2. What are essential skills? How to read/review papers, ask questions, and give talks?

3. How to master the skills? The three pass approach; Structure of a review; Guidance for asking questions; Five steps in preparing a talk

Action: Please follow these approaches throughout the entire course to read/review papers, ask questions, and give talks

How to give a great research talk

by Simon Peyton Jones

