Essential Skills Needed for a PhD Student

CMPT 884, FALL 2016

JIANNAN WANG
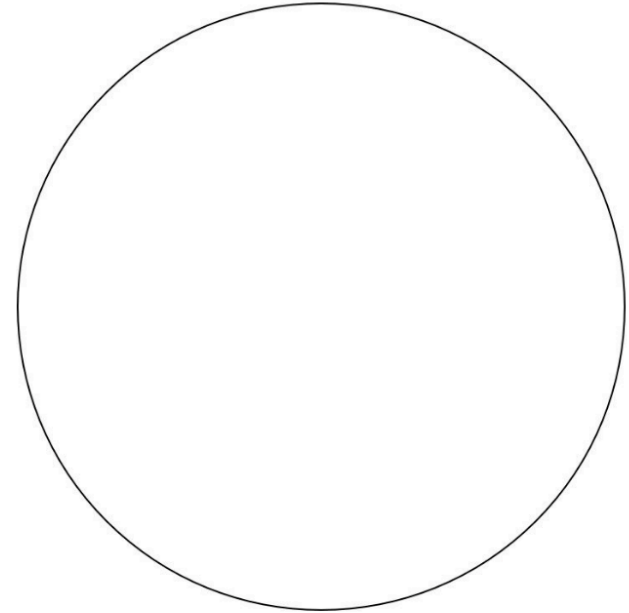
https://sfu-db.github.io/cmpt884-fall16

What is a PhD?

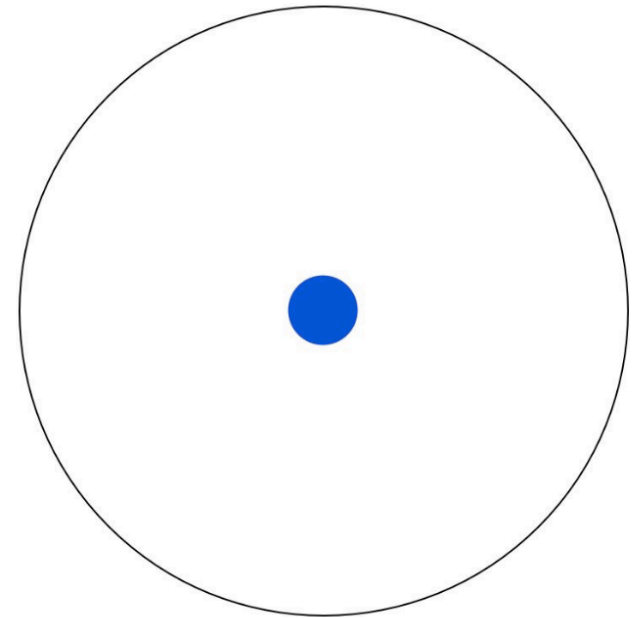**5 more years of learning new knowledge**

What is a PhD?

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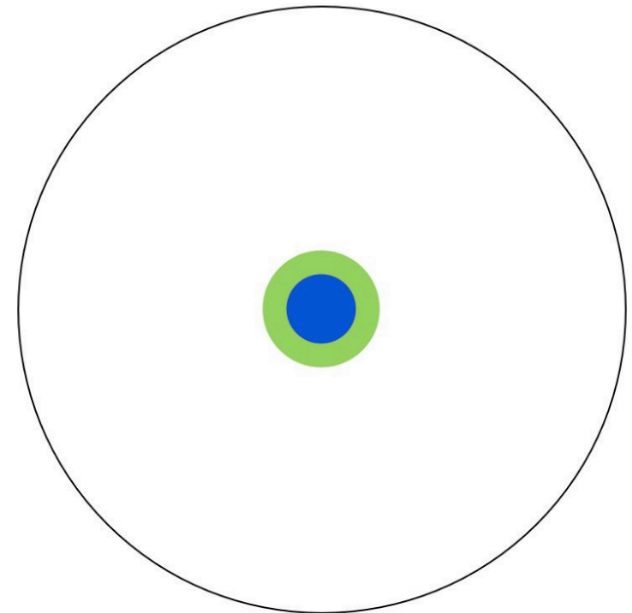**all of human knowledge**

From

What is a PhD?

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

From

What is a PhD?

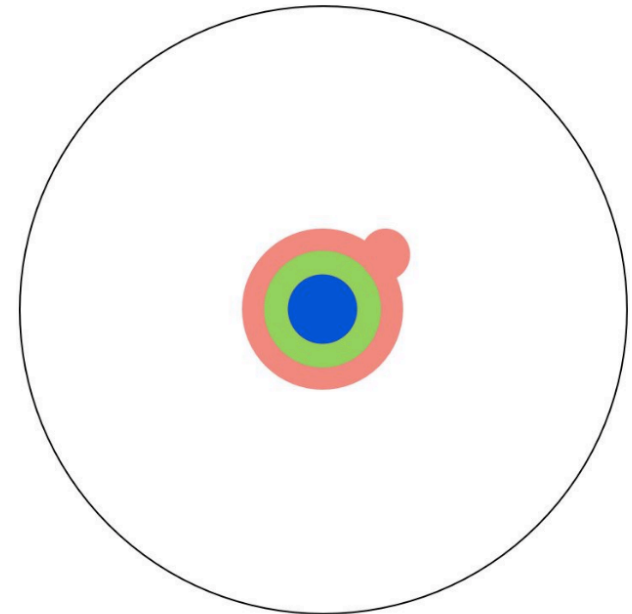By the time you finish
high school,
you know a bit more

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

What is a PhD?

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

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

What is a PhD?

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

From http://matt.might.net/articles/phd-school-in-pictures/
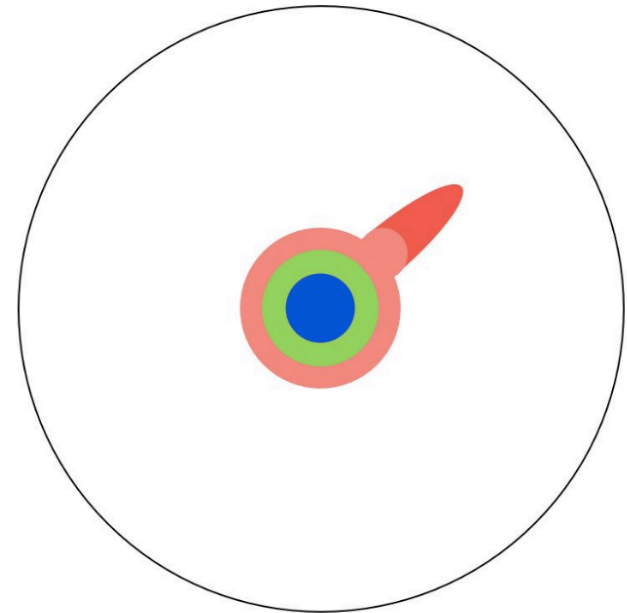
What is a PhD?

Reading papers takes you
to the edge of human knowledge.

From http://matt.might.net/articles/phd-school-in-pictures/
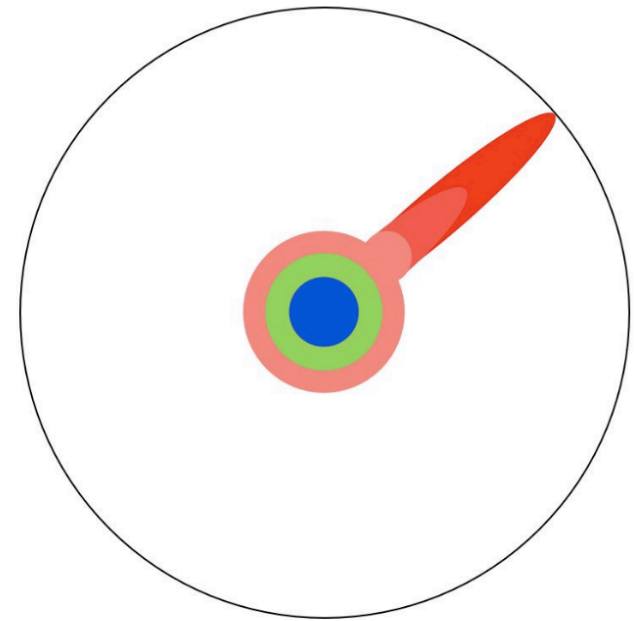
What is a PhD?

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

From http://matt.might.net/articles/phd-school-in-pictures/
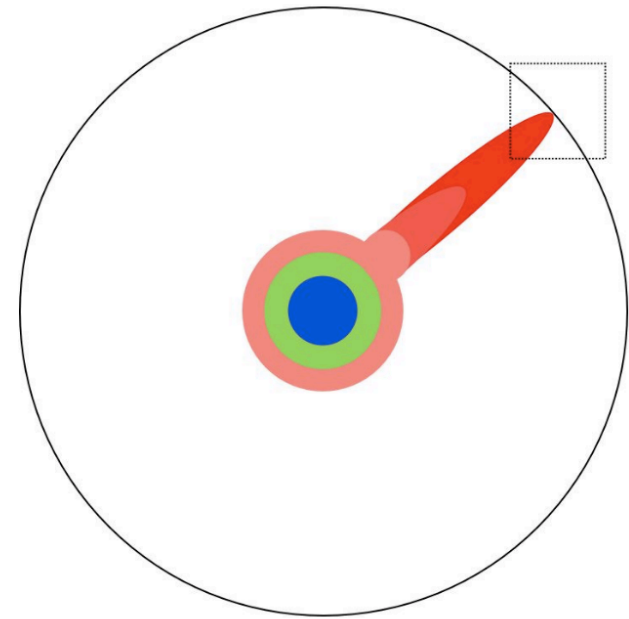
What is a PhD?

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

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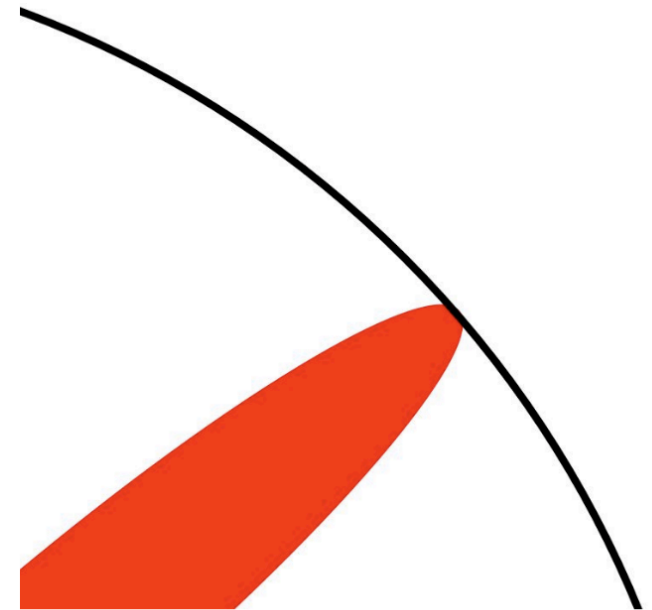
What is a PhD?

Until one day, **the boundary gives way.**
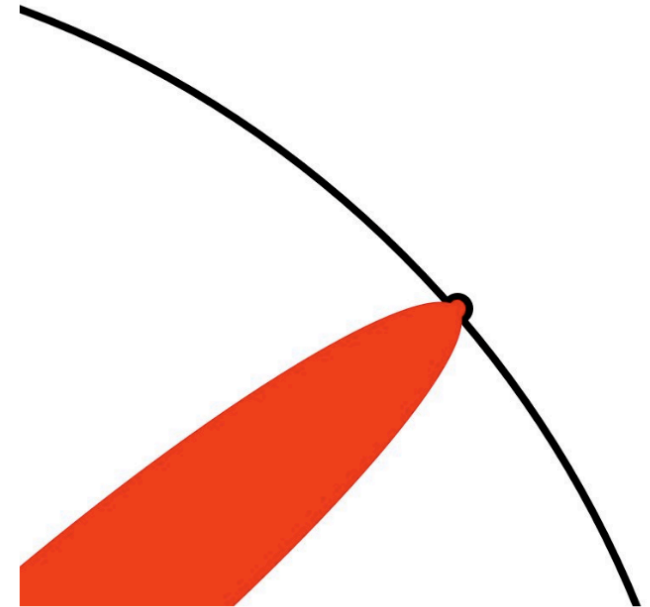
What is a PhD?

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

Ph.D.

From http://matt.might.net/articles/phd-school-in-pictures/
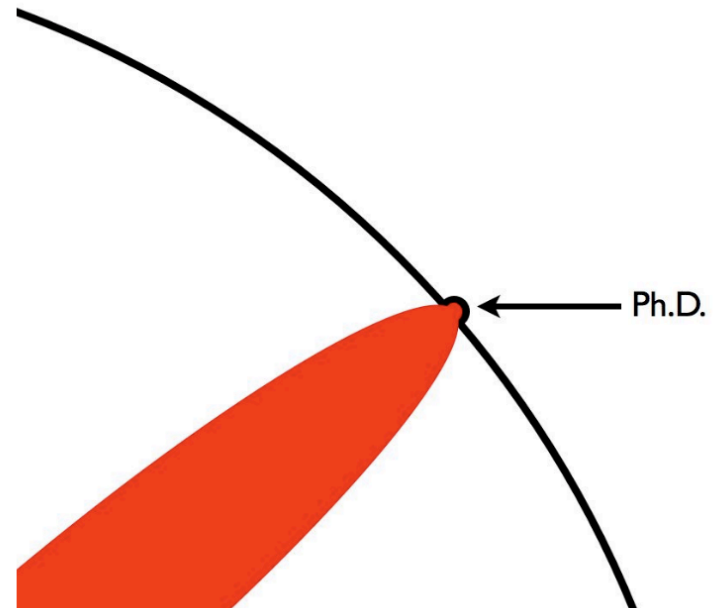
What is a PhD?

Thanks to your contribution!
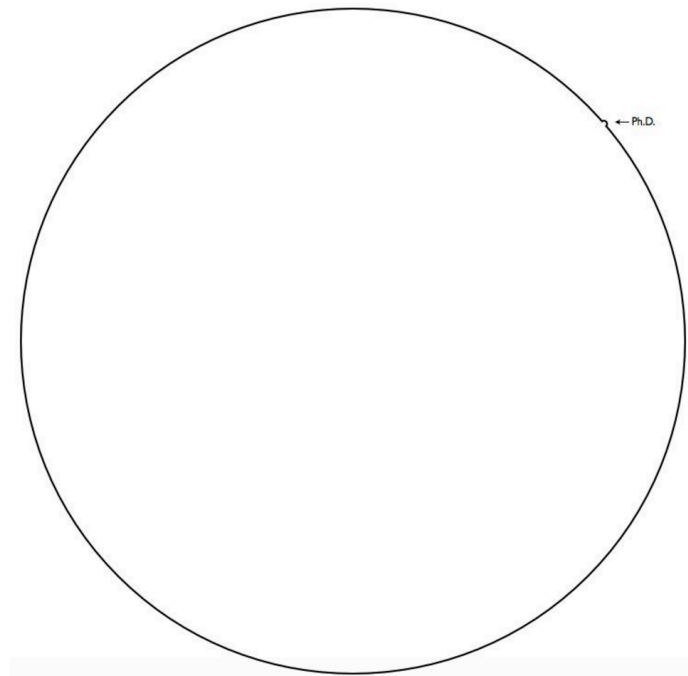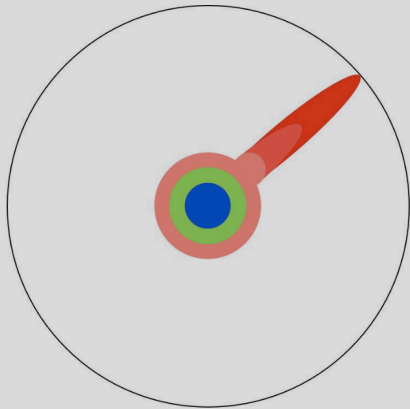
← Ph.D.

Essential Skills

Reading Papers

Critical Thinking
◦ Reviewing Papers
◦ Asking Questions
◦ ...

Presentation
◦ Giving Talks
◦ ...

Ph.D.
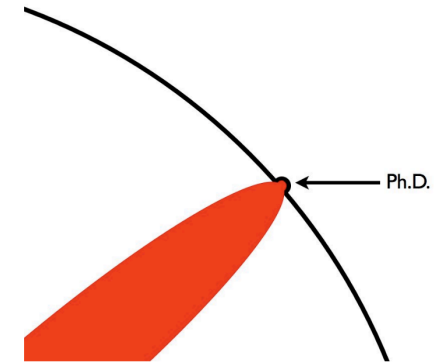
Reading Papers

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, and Conclusion
- Glance over the mathematical content (if any) and the references

You should be able to answer the five Cs:

- Category: What type of paper is this?
- Context: Which other papers is it related to?
- Correctness: Do the assumptions appear to be valid?
- Contributions: What are the paper's main contributions?
- Clarity: Is the paper well written?

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

The **1ˢᵗ** Pass
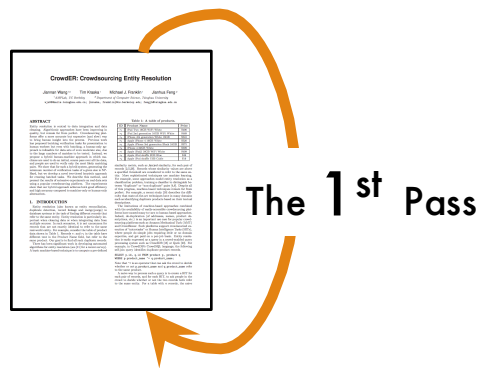
Stop here if
not interesting

When to use which

The **2**nd Pass
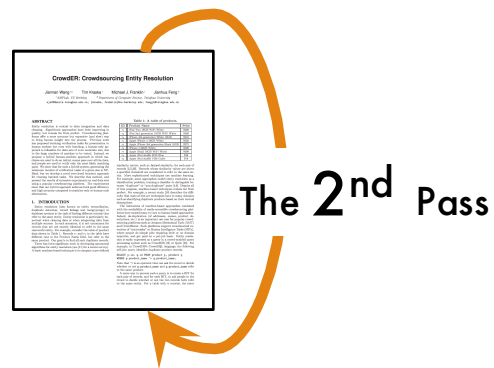
Stop here if not in your
research specialty

When to use which

The **3**rd Pass
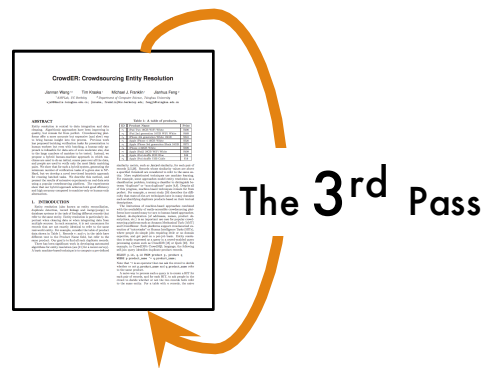
Fully understand the paper

Essential Skills
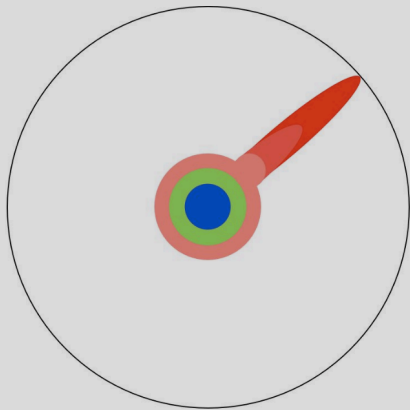
Reading Papers

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- ...

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Ph.D.
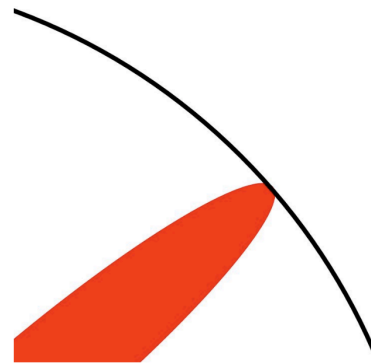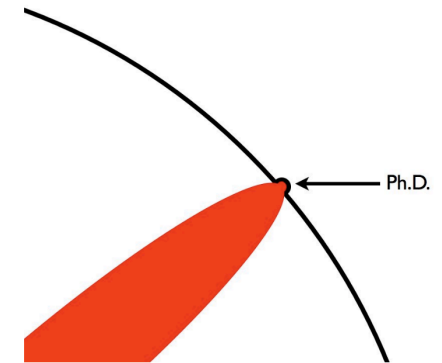
Why Paper Review

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)
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
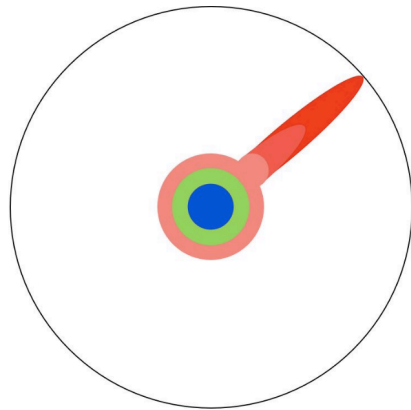
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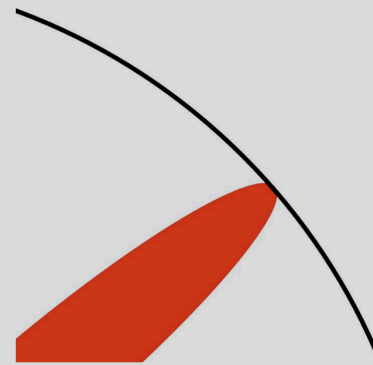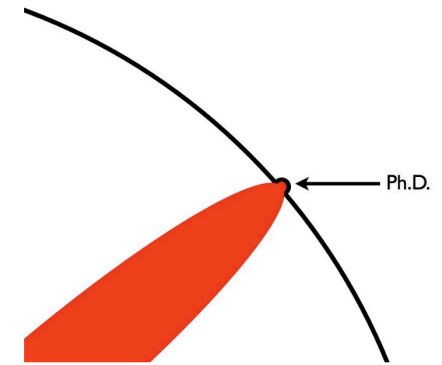
Plenty of Opportunities

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 Defence

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
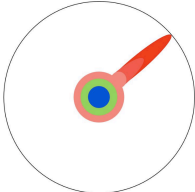
Steps in Preparing a Talk - 3

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 .

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