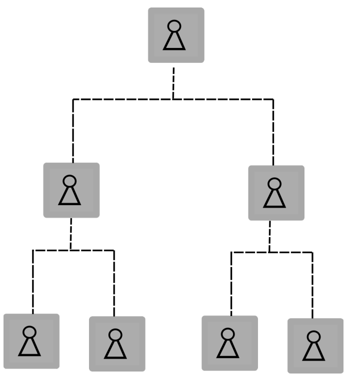
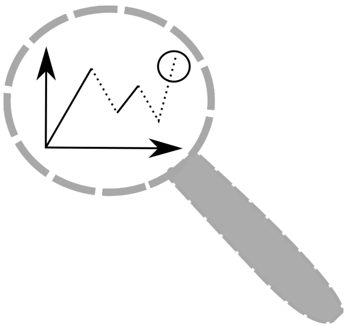
The *ideal* lab

Silvia Pintea

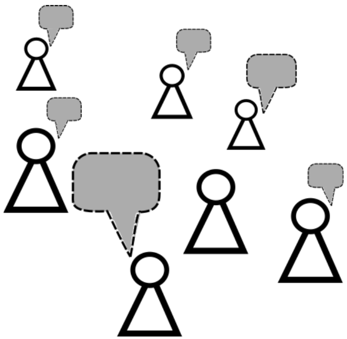
(1) Meetings and organization



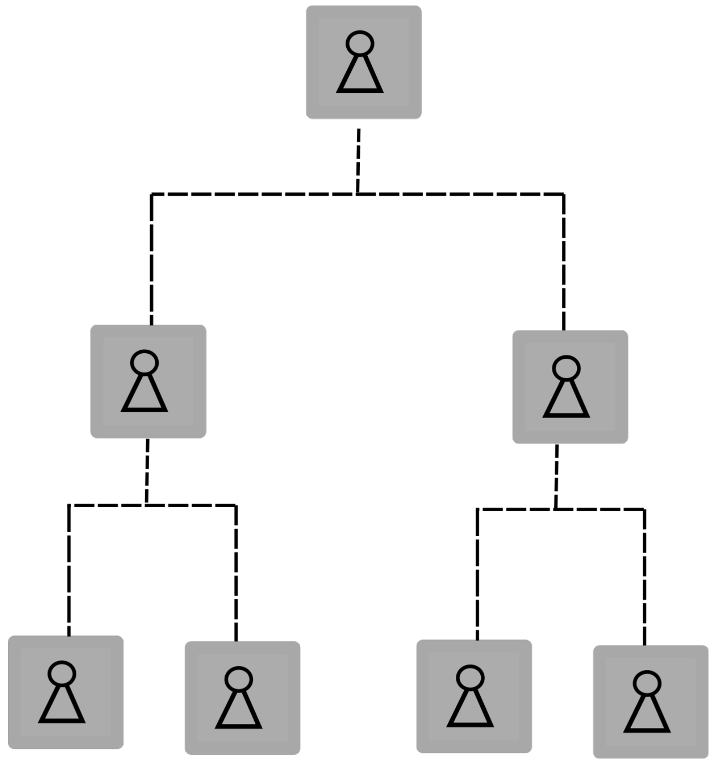
(2) Research process



(3) Communicating research

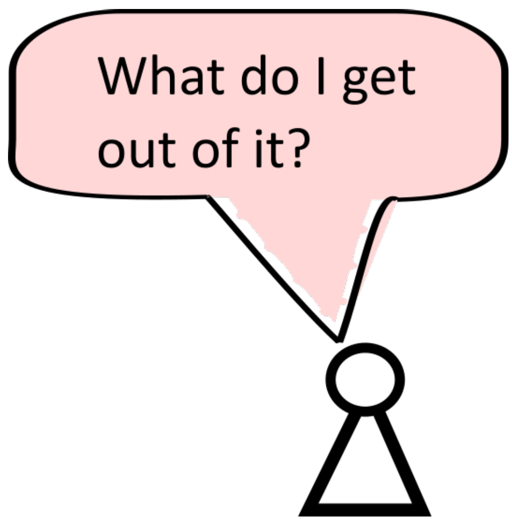


(1) Meetings and organization



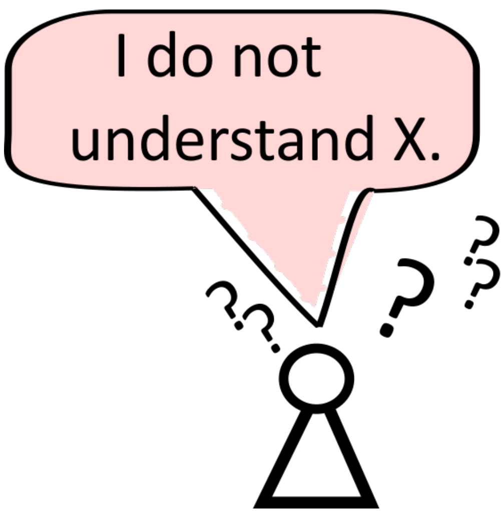
(1) Meetings and organization

- Having group research meetings is great!
  - What do you get out of these Monday meetings?
  - If only completed work is presented nothing!
  - The goals should be to: get ideas, brainstorm, ask your colleagues if your work makes sense.



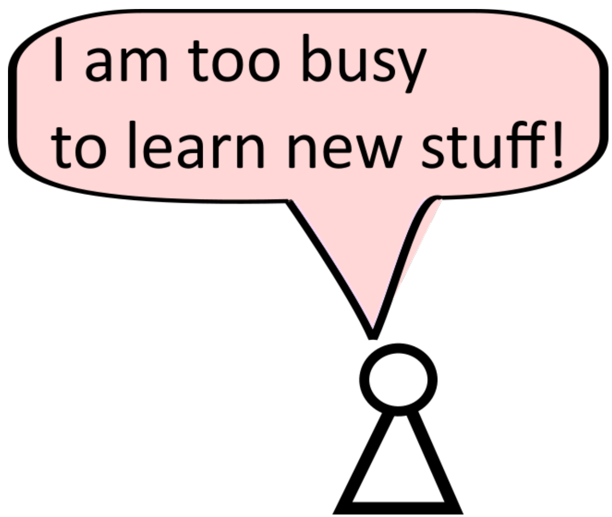
(1) Meetings and organization

- Meetings should be a "Safe space"
  - Safe to say: *"Hey, I do not understand x!"* or *"I do not know X, can you explain"*
  - PIs should set an example:
    Importance of stupidity: https://journals.biologists.com/jcs/article/121/11/1771/30038/The-importance-of-stupidity-in-scientific-research
  - Questions from junior researchers first!
  - Don’t be threatened by researchers/students who are smarter than you.



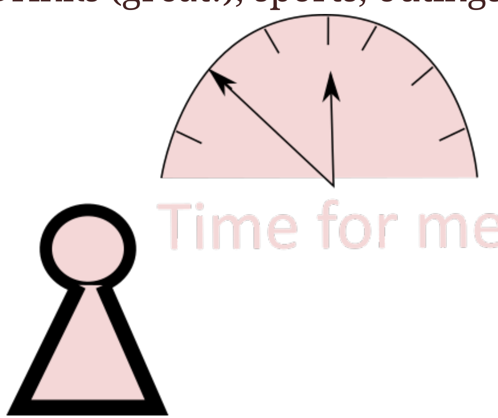
(1) Meetings and organization

- Reading groups: *"I am to busy to join"*, *"It's not on my topic"*, etc?
  - How can you come up with interesting new ideas without reading and talking about ideas?
  - Your job as a researcher is to learn new things.
  - Take interest in other fields and topics. You may get inspired (See: transformers).



(1) Meetings and organization

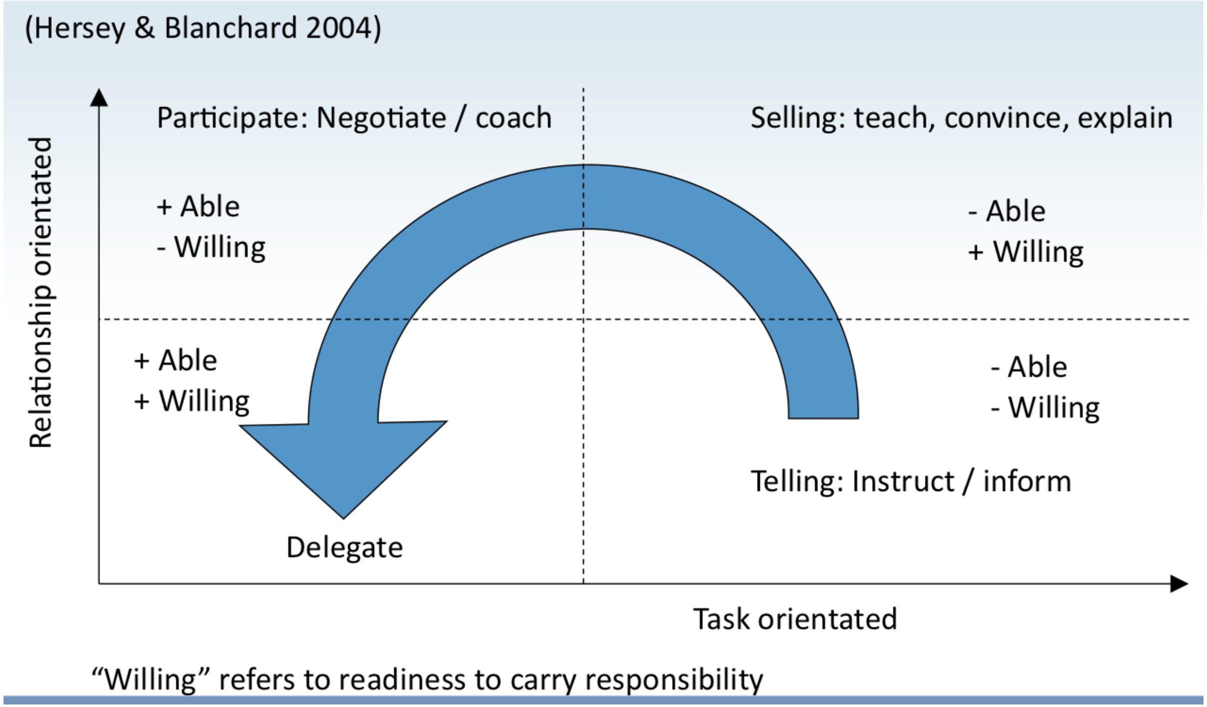
- Deal with stress:
  - Get a hobby other than work, so you do not define yourself as your work. (Stress in academia: Charles Sutton https://www.theexclusive.org/2018/03/tournament-axe.html)
  - Sickness means sickness: Do not come to work sick (and get others sick as well).
  - Free time is free: No expectation to be active on teams/email/etc.(Not even if your supervisor says so!)
  - Personal life is personal: No pressure to use personal phone numbers for meetings, or social media, or etc.
- "Deep work" needs large continuous chunks of time for focus.
  - Group your meetings, and minimize them (See Harvard business review: "Stop the meeting madness" https://hbr.org/2017/07/stop-the-meeting-madness)
- Have social activities: Drinks (great!), sports, outings, etc.



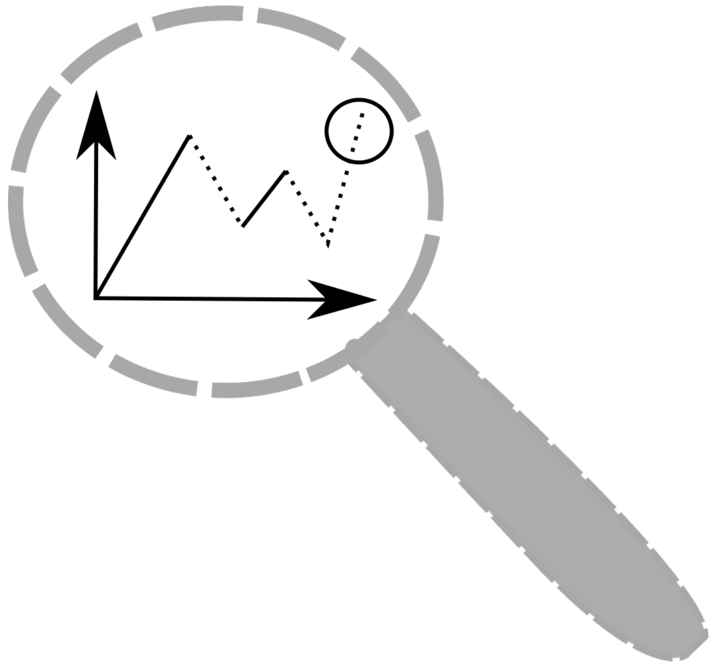
(1) Meetings and organization

A good leader:

- Admits and encourages people to admit ignorance, on a specific topic.
  https://journals.biologists.com/jcs/article/121/11/1771/30038/The-importance-of-stupidity-in-scientific-research
- Gives, educates and inspires
  https://alternative-democracy-research.org/2020/04/20/what-was-important/
- There is no-one-style supervision style that works for all.



(2) Research process



(2) Research process

Joshua Tenenbaum:

(1) Don’t waste time doing research you don’t love.

(2) Don't waste time doing research that other people can do better than you can.

(3) Don't waste time doing research that other people in your field won't care about. (It's okay, and probably a good sign, if some people won't appreciate it, as long as enough people will.)

From https://people.csail.mit.edu/billf/talks/10minFreeman2013.pdf

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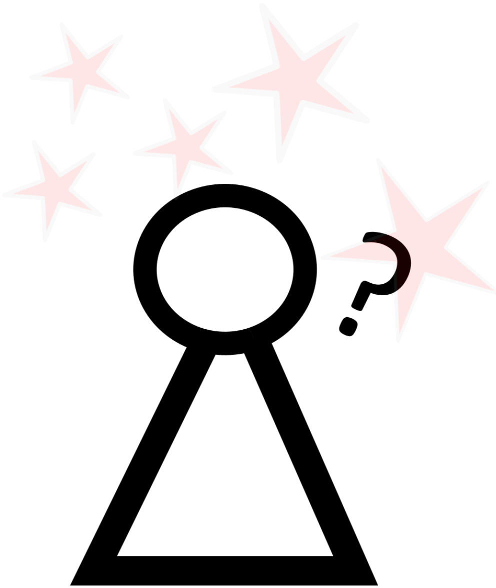


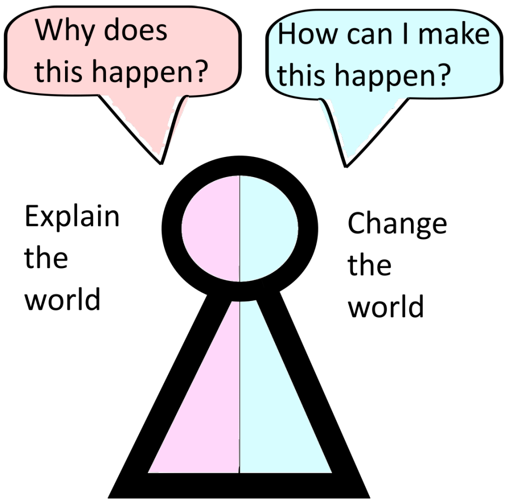
Selecting the problem:

- Half of the work is finding a good question / research topic
- Challenge the status quo. What is important in your field?
  (Richard Hamming https://www.cs.virginia.edu/~robins/YouAndYourResearch.html)
- Focus on problems that people care about
- Multi-disciplinary is better
- Have fun and be excited about your work
- Use knowledge around you: what are your colleagues good at?
- Run experiments to discover real problems
- Use intuition to ask questions, not to answer them

Inspired from "Do Good Research and Run a Great Lab" (Frédo Durand)

"How to Have a Bad Career in Research/Academia" (David A. Patterson)

(2) Research process



A good research question:

- Solving it has important consequences
- Solvable: you have an angle of attack
- Assessable: you can measure success, ideally quantitatively
- Still relevant in 5-10 years
- Exciting to you (very important!)
- Nice pluses: not too crowded

Papers are about "Why?" not "How?"

- Arriving at a good research question means going through messy prototypes
- Hypothesis testing on *small fully-controlled datasets*
- Research means a lot of failure and learning

(https://journals.biologists.com/jcs/article/121/11/1771/30038/The-importance-of-stupidity-in-scientific-research).

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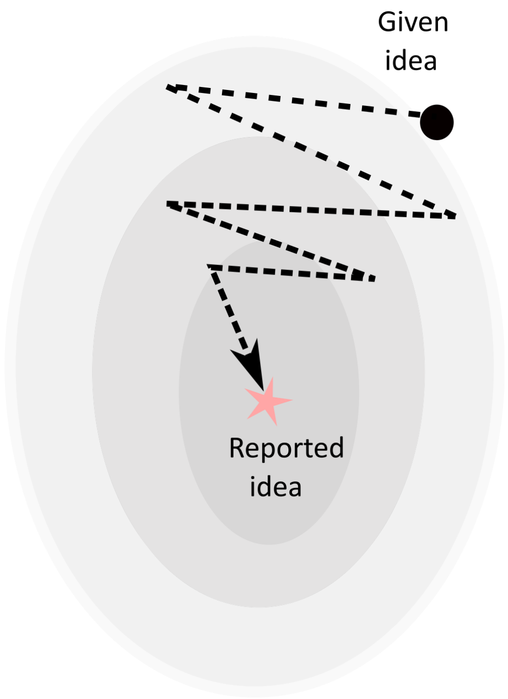

Picking a solution

- Keep things simple unless a very good reason not to
- Pick innovation points carefully, and be compatible everywhere else
- Best results are obvious in retrospect
- Dont say "It does does not work!" explain why it does not work.
- If not working, maybe change the question
  – *"The strong student starts doing what the advisor has asked, sees that it doesn't work, looks around within some epsilon ball of the original proposal to find what does work, and reports that solution."*

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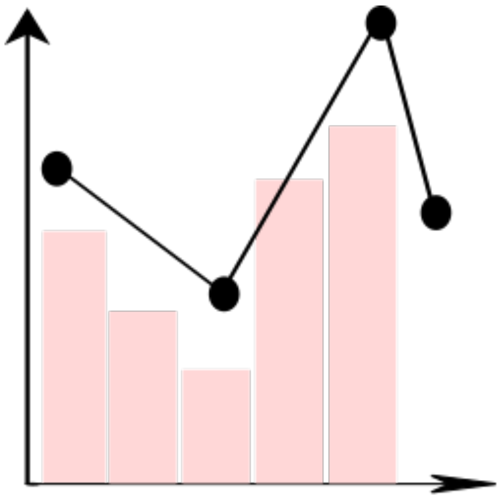

Data and code?

- You worked on this project for x years
  – You collected x data samples
  – You annotated them
  – Your wrote x articles
- What do you leave behind?
- What happens to the data you collected and annotated?
- How will people compare with you?

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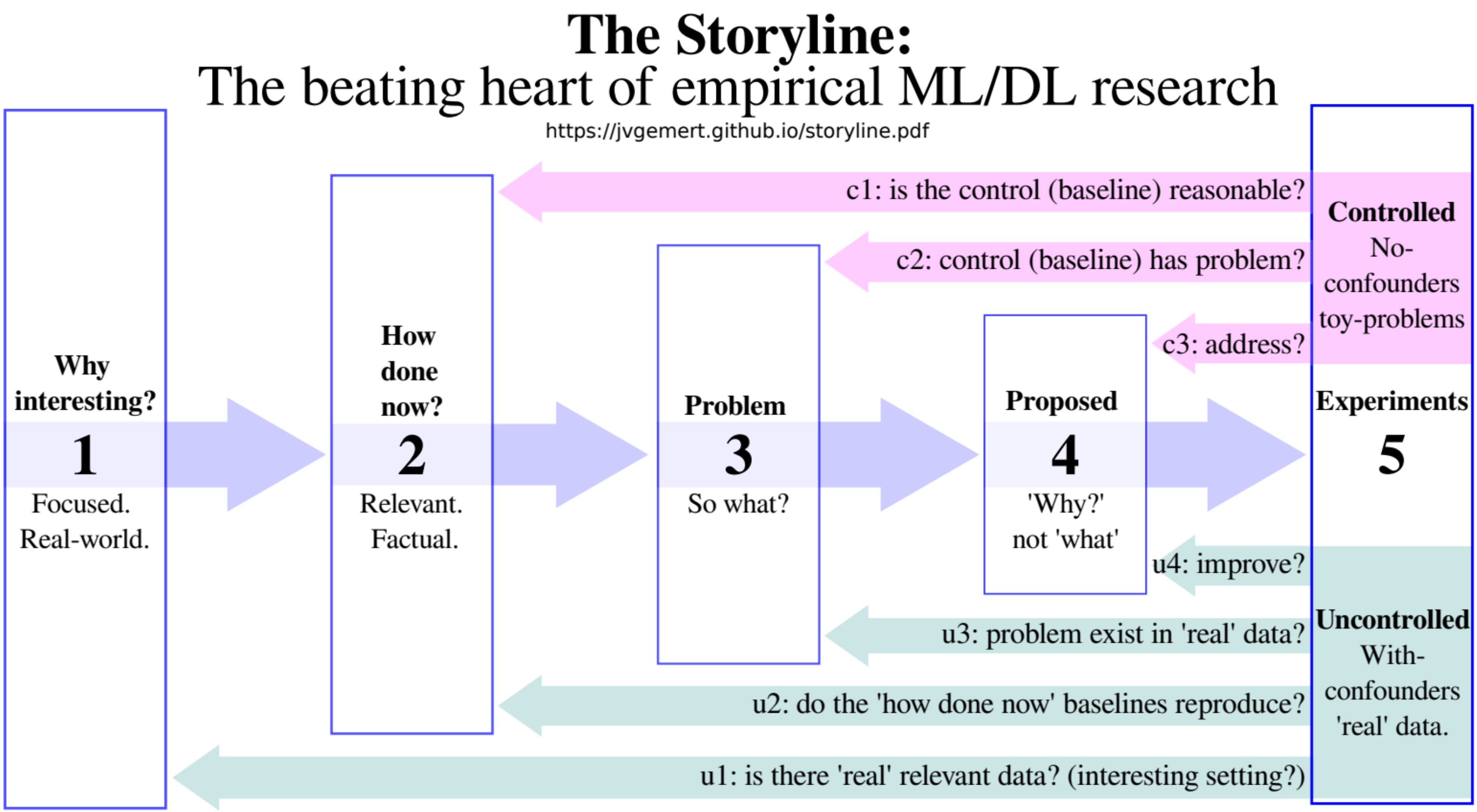
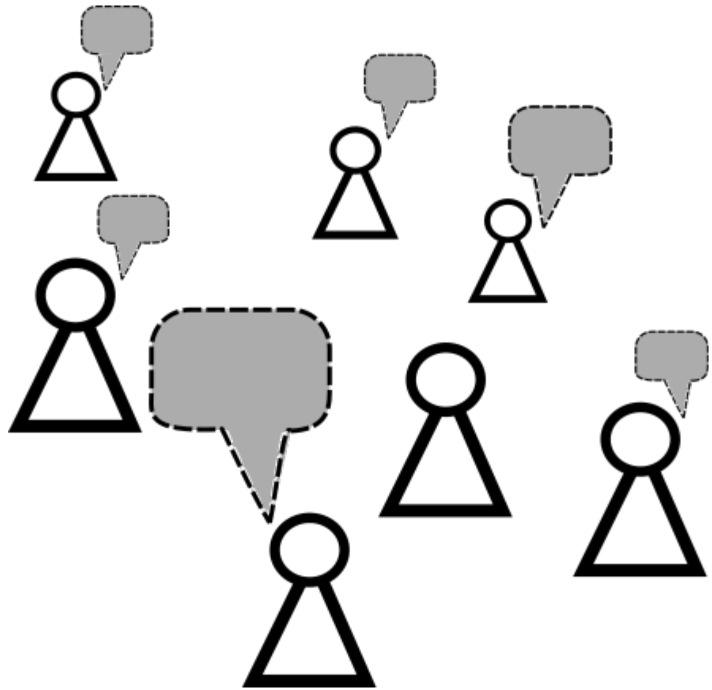


From "Research Guidelines", Jan van Gemert

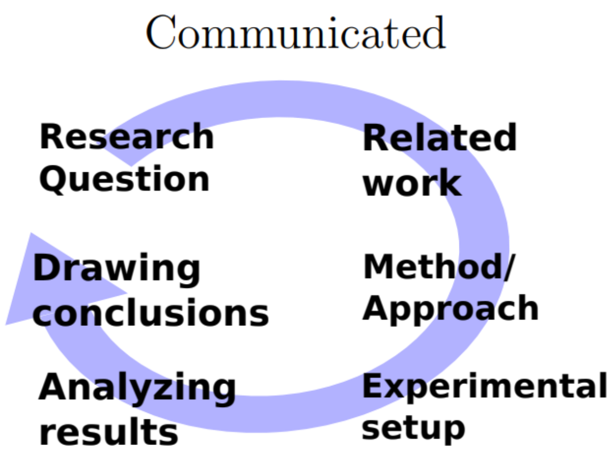
(3) Communicating your research

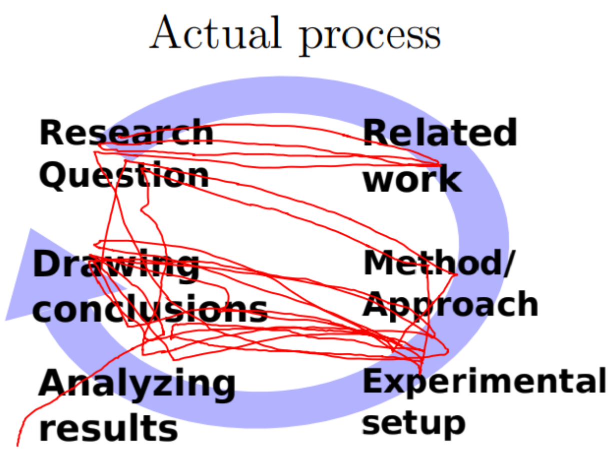


(3) Communicating your research

In meetings/presentations:

- Focus on the content more and less on the process:
  - Not what have you done in the last week
  - But, what have you found out?
- Each experiment should test something.
  - Why are your running that experiment?
  - What (part of the) research question are you testing?
- What do the results show? Can you conclude anything?
- If something does not work, why it does not work?





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(3) Communicating your research

In writing:

- You do not write for yourself but for others.
  – if nobody understands, why write it?
- Simple is good!
  – Uncluttered math formulas
  – Simple and clear figures (But complete!)
  – Simple sentences and consistent: i.e. do not use multiple words to mean the same thing: "action", "activity", "event".
- People remember stories.

- Great book: **"The Writing Workshop: Write More, Write Better, Be Happier in Academia"** (Barbara W. Sarnecka)
- Jan van Gemert's writing guidelines: **https://jvgemert.github.io/writing.pdf**

(3) Communicating your research

Paper story line:

1. **Why interesting?** What is the general setting/application. Why should people care.
2. **How done now?** The typical approach(es) to the setting in (1)
3. **What is missing?** What's the problem in (2), and what consequences does this have.
4. **Proposed solution**. What do you do, and why does it solve the problem in (3)
5. Experimental questions. **How do you evaluate experimentally that (4) solves the problem in (2) and it's consequences in (3).**

From Jan van Gemert's paper_skeleton

Questions?

Resources:

- Martin A. Schwartz, "Importance of stupidity in scientific research": https://journals.biologists.com/jcs/article/121/11/1771/30038/The-importance-of-stupidity-in-scientific-research
- Charles Sutton, "Stress in Research. Part I-IV": https://www.theexclusive.org/tag/stress%20in%20research/
- Jan Blommaert, "Looking back: What was important?": https://alternative-democracy-research.org/2020/04/20/what-was-important/
- Bill Freeman, 10 min talk: "https://people.csail.mit.edu/billf/talks/10minFreeman2013.pdf"
- Richard Hamming, "You and your research": https://www.cs.virginia.edu/~robins/YouAndYourResearch.html
- Frédo Duran "Do good research and run a great lab": https://www.thecomputationalphotographer.net/wp-content/uploads/2022/09/REsearch.pdf
- David A. Patterson "How to Have a Bad Career in Research/Academia" https://people.eecs.berkeley.edu/~pattrsn/talks/BadCareer.pdf
- Jan van Gemert "Research guidelines" https://jvgemert.github.io/ResearchGuidelinesInDL.pdf
- Jan van Gemert "Writing guidelines" https://jvgemert.github.io/writing.pdf
- Barbara W. Sarnecka "The Writing Workshop: Write More, Write Better, Be Happier in Academia" https://osf.io/n8pc3/
- More links: https://jvgemert.github.io/links.html