

Thesis Seminar

Introduction to Science and the empirical research process

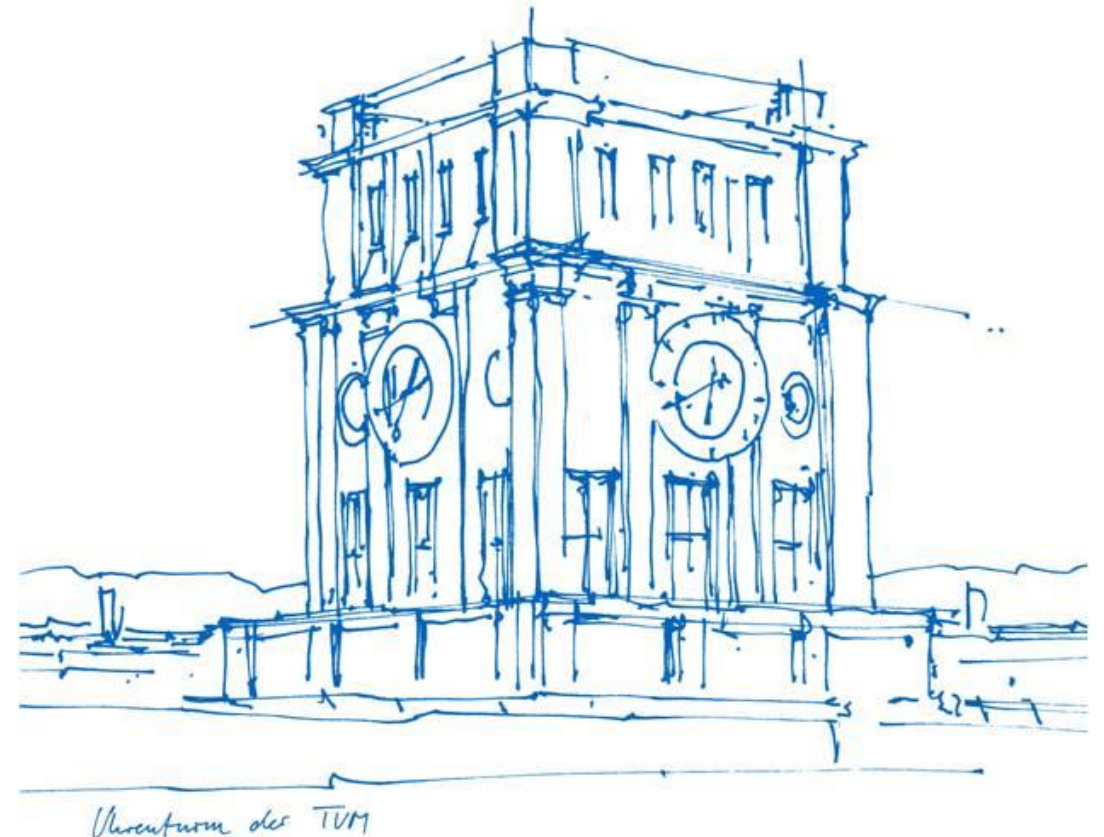
Dr. Theresa Treffers

Technical University of Munich

TUM School of Management

Chair for Strategy and Organization

Prof. Dr. Isabell M. Welp



Welcome!



Prof. Dr. Theresa Treffers

- Post-doc at the Chair of Strategy and Organization
- Associate Professor for Entrepreneurship at Seeburg Castle University
- Education and academic positions: University of Munich, National University of Munich, Rotterdam School of Economics, Columbia University, Technical University of Eindhoven
- Research interests: Strategic, innovative, and entrepreneurial behavior
- Method: Experiments
- Current research projects: PlayMINT, MINT@Work, Diversity, (virtual/digital) Leadership and Teams, Coaching

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RESEARCH
WITH IMPACT



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Looking for a (side) job?



Student/Research Assistants

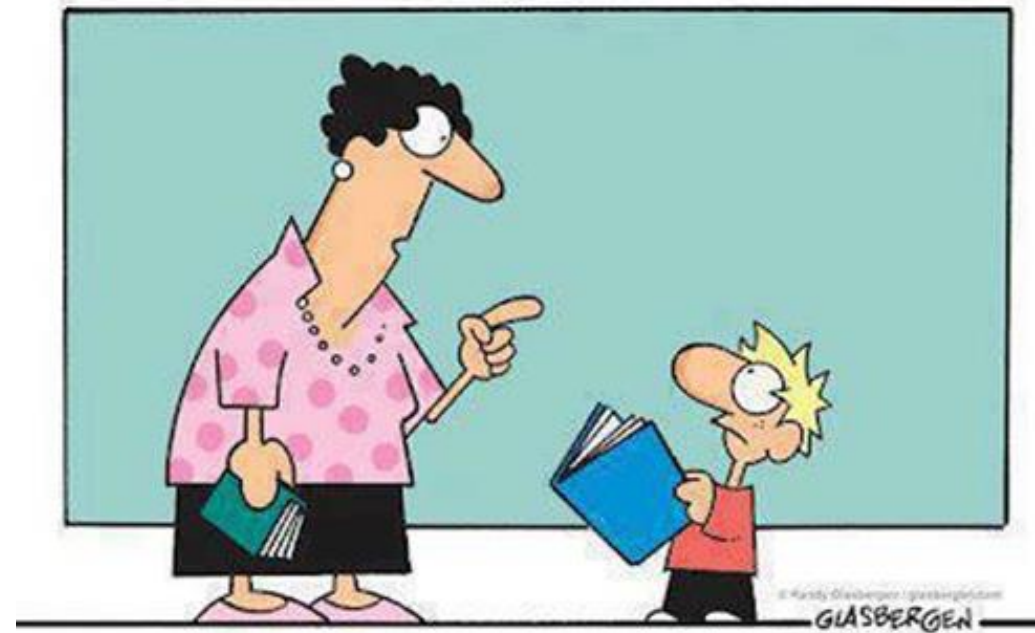
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OR

Final Thesis & Project Studies

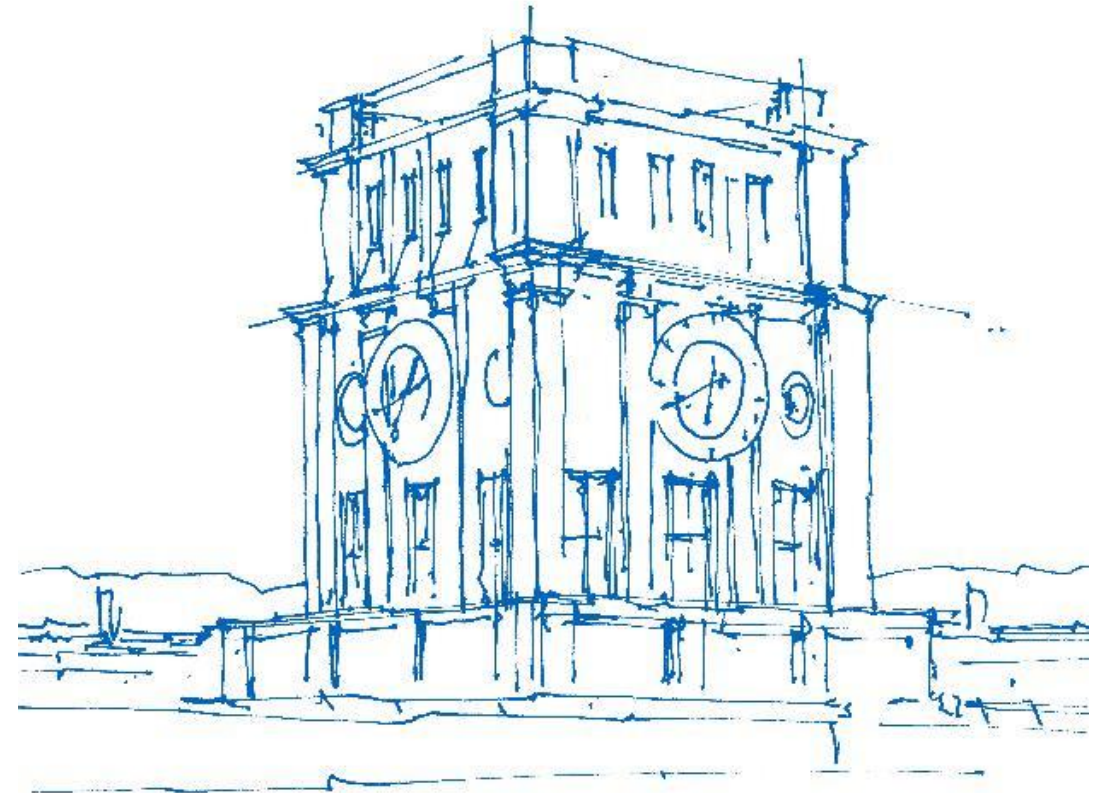
<https://www.notion.so/tum-cso/Final-Theses-Bachelor-Master-29baca3b9cc44c15b3ceea10eb9cc3ec>

Course material are available on Moodle



It's called **reading**.
It's how people install new
software into their brains.

Introduction to science



Uhrenturm der TUM

Good Research Practice

“Good research practice underpins high-quality science and supports the robust evidence base needed to drive improvements in practice.”

Medical Research Council (2012)



Good scientists employ
good research practices



Science...

...is the engagement with a (practically relevant) topic...

... based on extant state of research and using established research methods





...so that the result of this research is verifiable and replicable by third parties



...and extends or provides new perspectives on current research.

Science is also a process, where...

...a topic or problem is approached scientifically:

-  Taking into account current scientific studies
-  Applying current scientific techniques and procedures

Scientific work

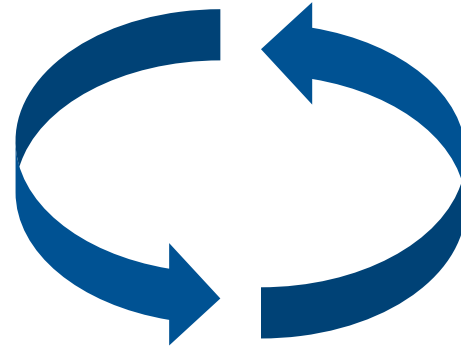
Good scientific work follows a structured, systematic approach: clear definitions, clear goal, clear arguments etc.

- 1. Verifiable and replicable**
- 2. Objective (value-free)**
- 3. Universal (generalizable)**

Empirical research

„**empirical**“ (εμπειρισμός → experientia): „based on experience“

Generating Hypotheses (inductive, explorative, mostly qualitative empirical)



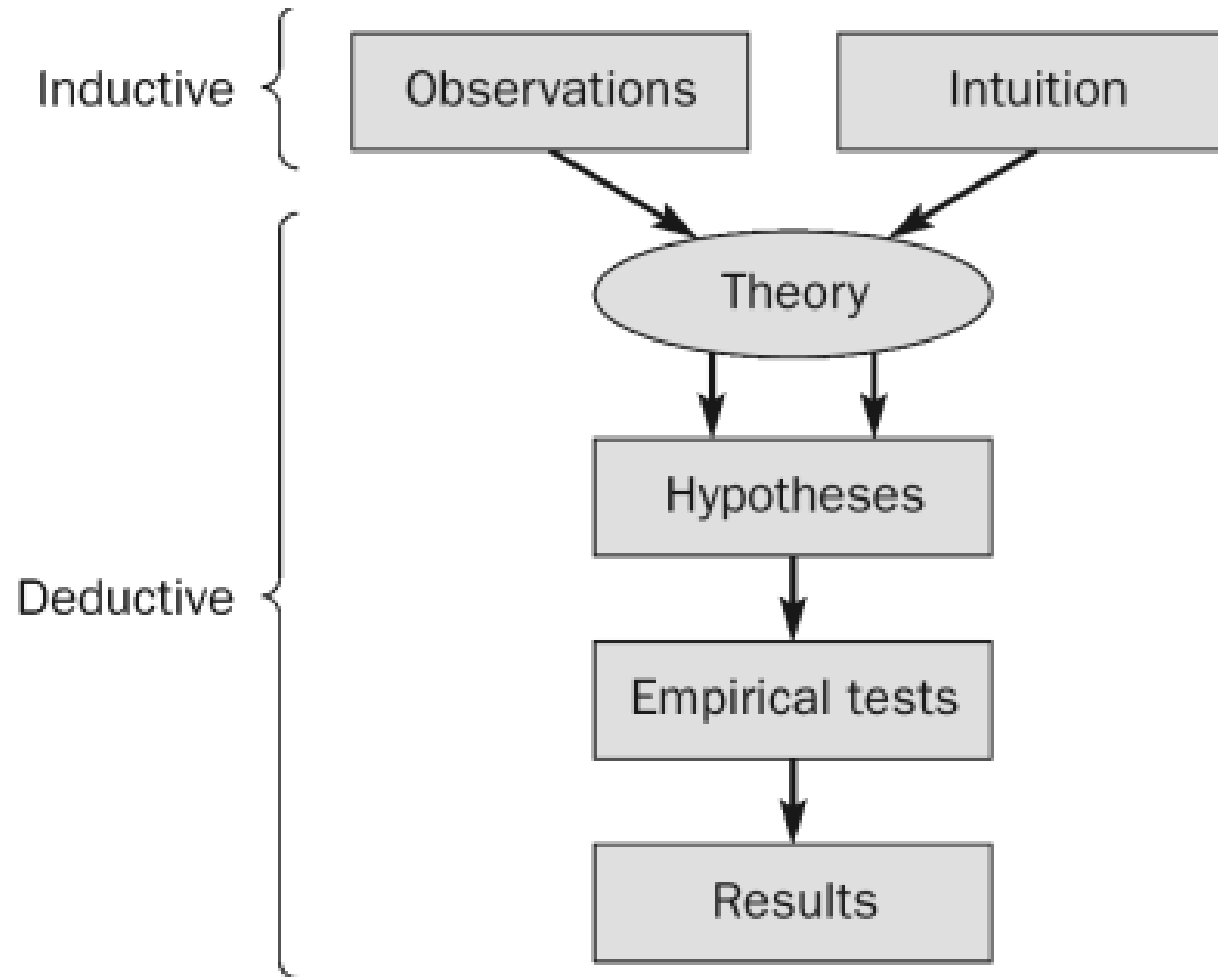
Testing Hypotheses (deductive, inferential, mostly quantitative empirical)

In god I trust, everybody else bring their data

(W. Edward Deming)



Inductive vs deductive



Qualitative vs Quantitative research

Qualitative research	Quantitative research
Inductive	Deductive
Subjective	Objective
Impressionistic	Conclusive
Holistic, interdependent system	Independent and dependent variables
Purposeful, key informants	Random, probabilistic sample
Not focused on generalization	Focused on generalization
Aims at understanding, new perspectives	Aims at truth, scientific acceptance
Case studies, content and pattern analysis	Statistical analysis
Focus on words	Focus on numbers
Probing	Counting

Source: Based on Patton (1990) and Chisnall (2001)

Table I. Qualitative versus quantitative research methods

Qualitative vs Quantitative research

Qualitative research:

a research approach that uses **phenomena of the human experience** as holistic as possible and wants to understand ("**subjective**").

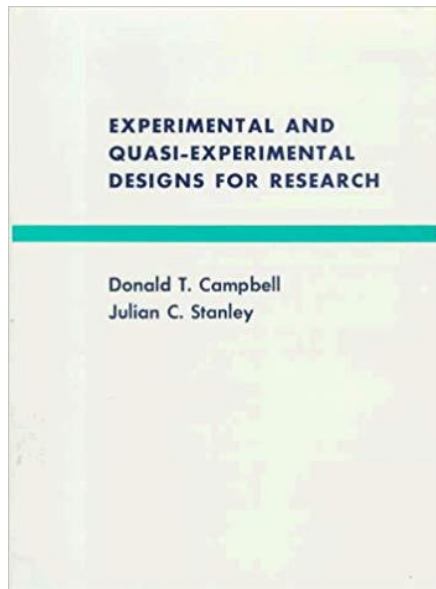
It uses thereby **open, not standardized collection methods** and **interpretive evaluation methods**.

The goal is to **construct theories about these phenomena** (but not to make general statements).

Quantitative research:

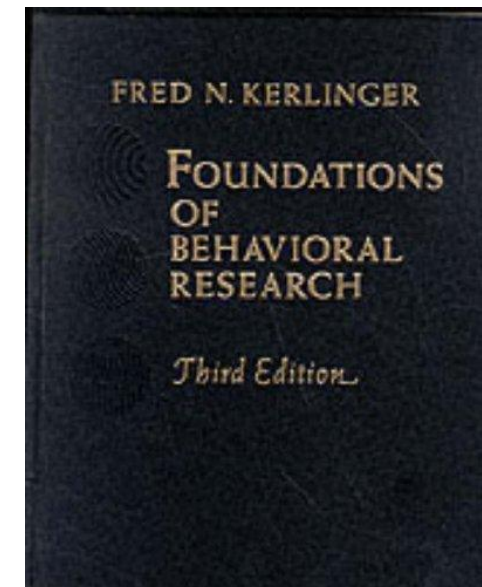
a research approach that is **theory-based** and uses standardized methods and **statistical evaluation methods**.

You want it to be **as objective as possible** by **analyzing numeric data** in order to **devise general statements**.

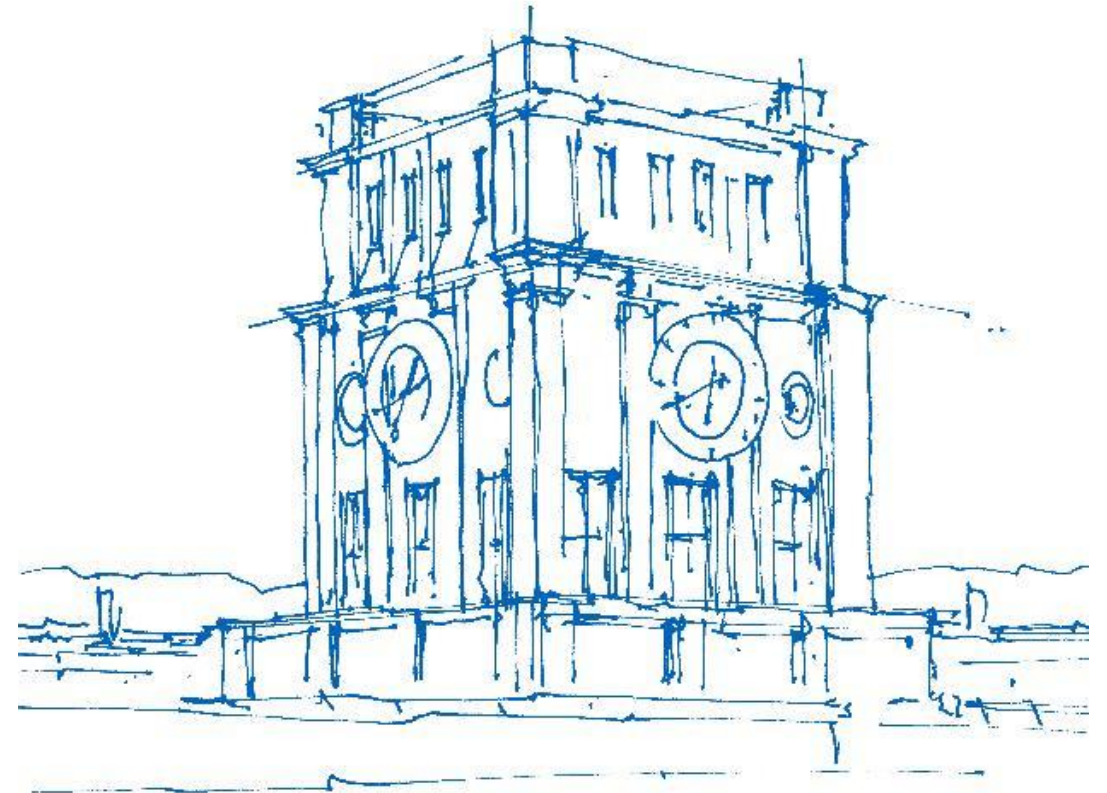


"All research ultimately has a qualitative grounding"
(Donald T. Campbell)

"There's no such thing as qualitative data. Everything is either 1 or 0"
(Fred Kerlinger)



The empirical research process and research topic

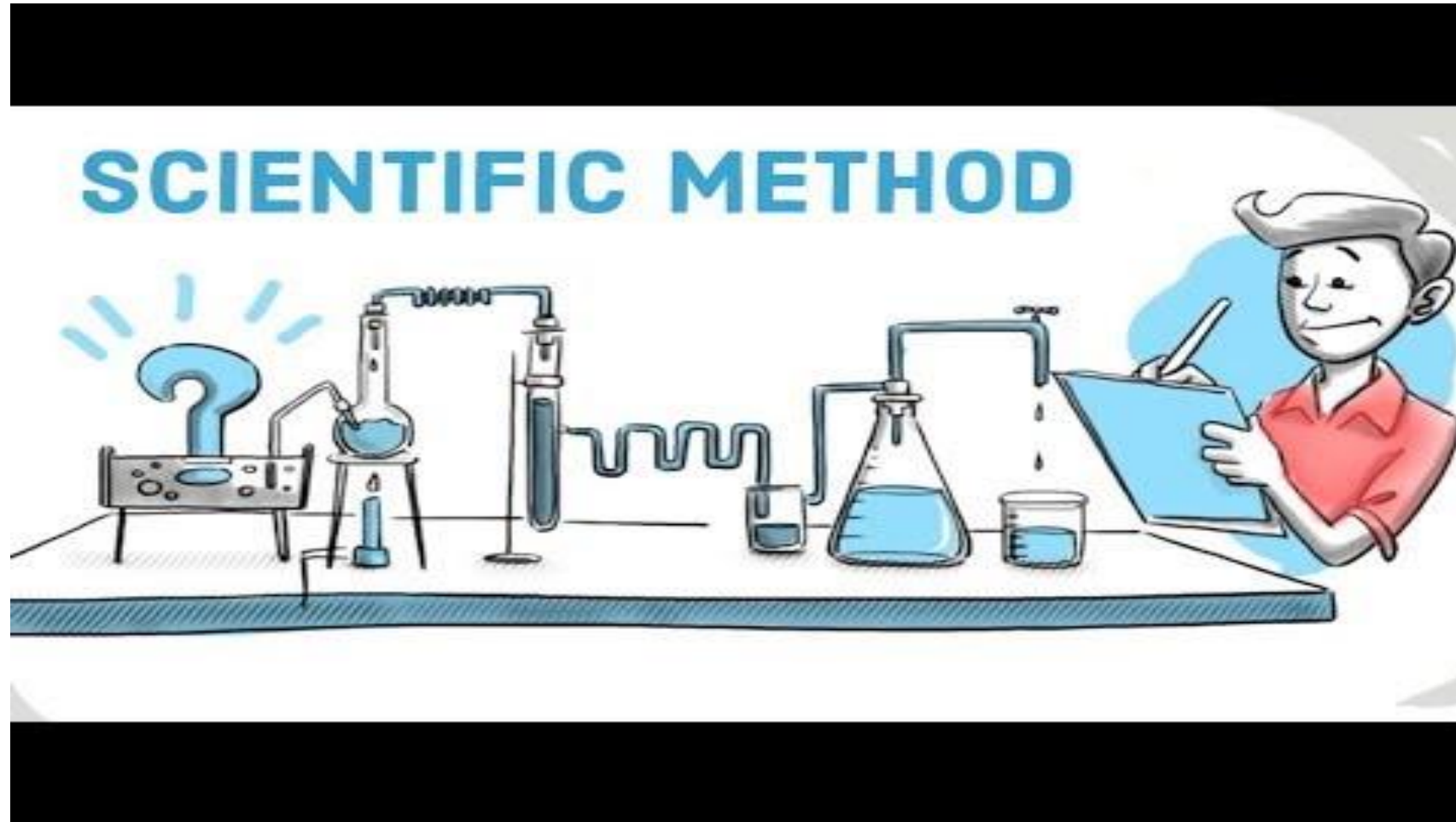


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Which steps does the empirical research process contain?



The scientific method



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Generating a research topic

(Systematic) literature search – state of research

Identification of research gaps

Formulation of research question

Theory choice

Formulating hypotheses

Planning research design

Pilot study

Data collection

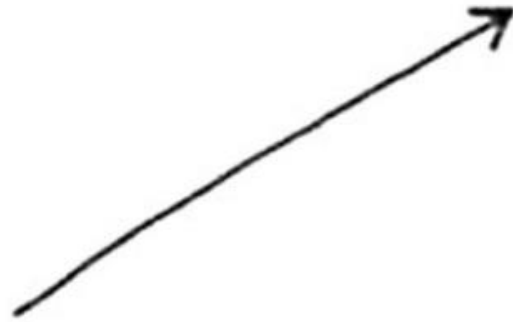
Data analysis

Interpretation of results

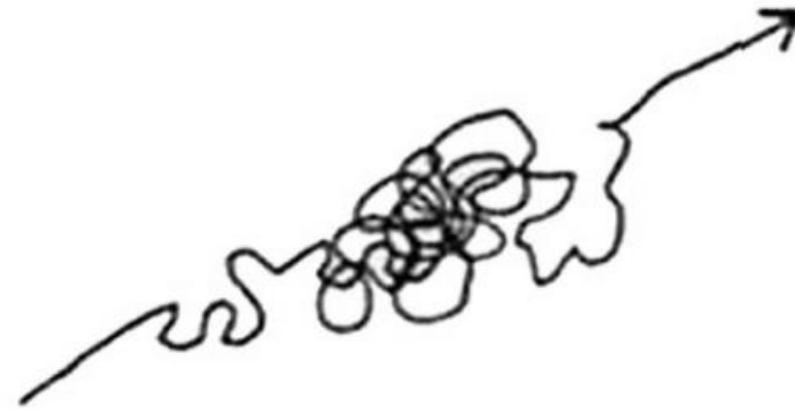
Distributing / Communicating results

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The empirical research process - revised

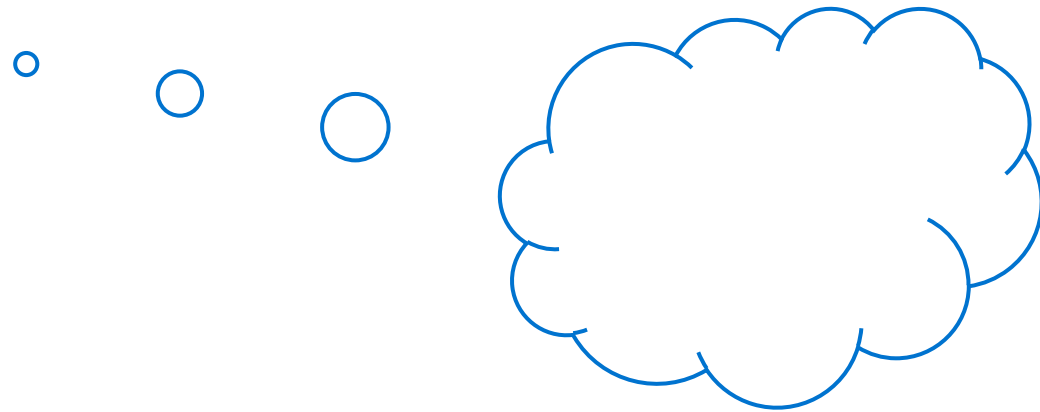
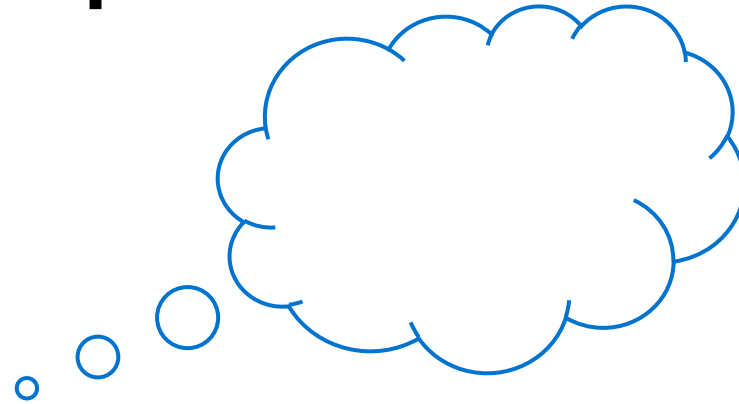


what people think
it looks like



what it really
looks like

Generating a research topic



The Power of Why?

The Value of Curiosity



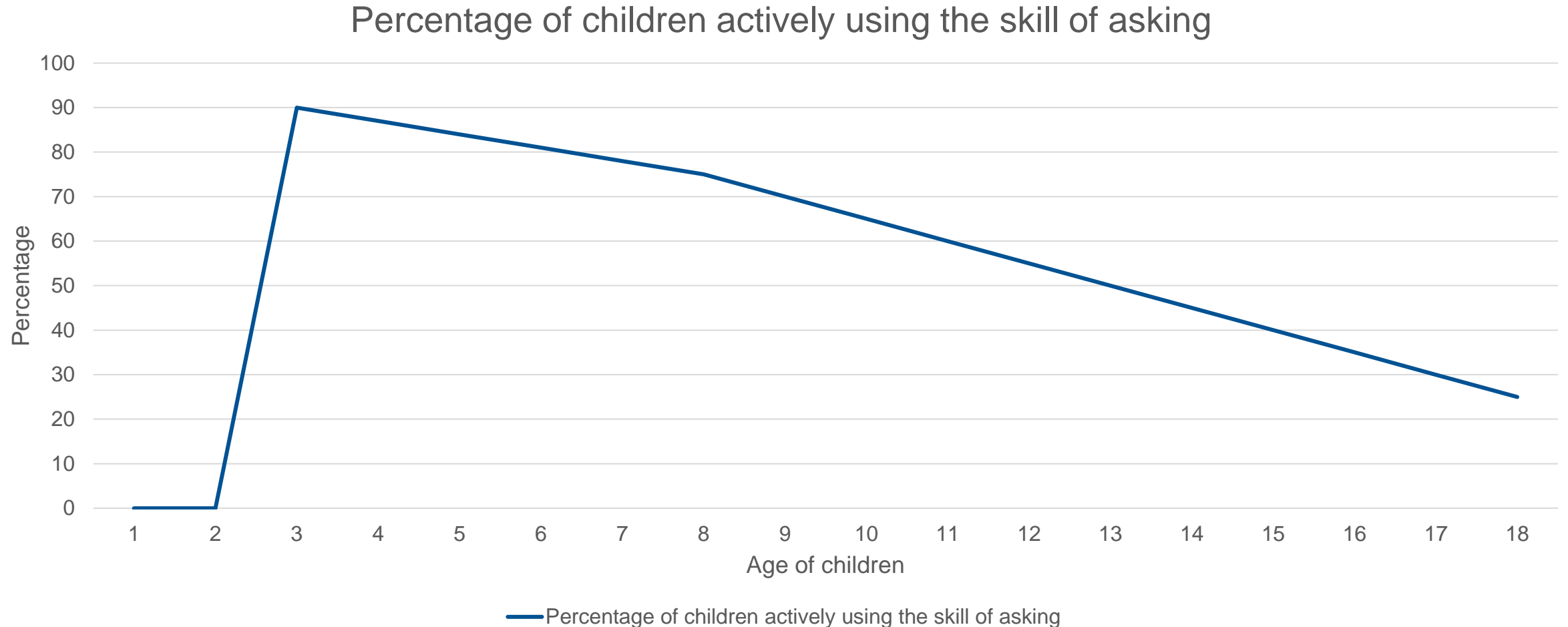
Great questions can lead to great success



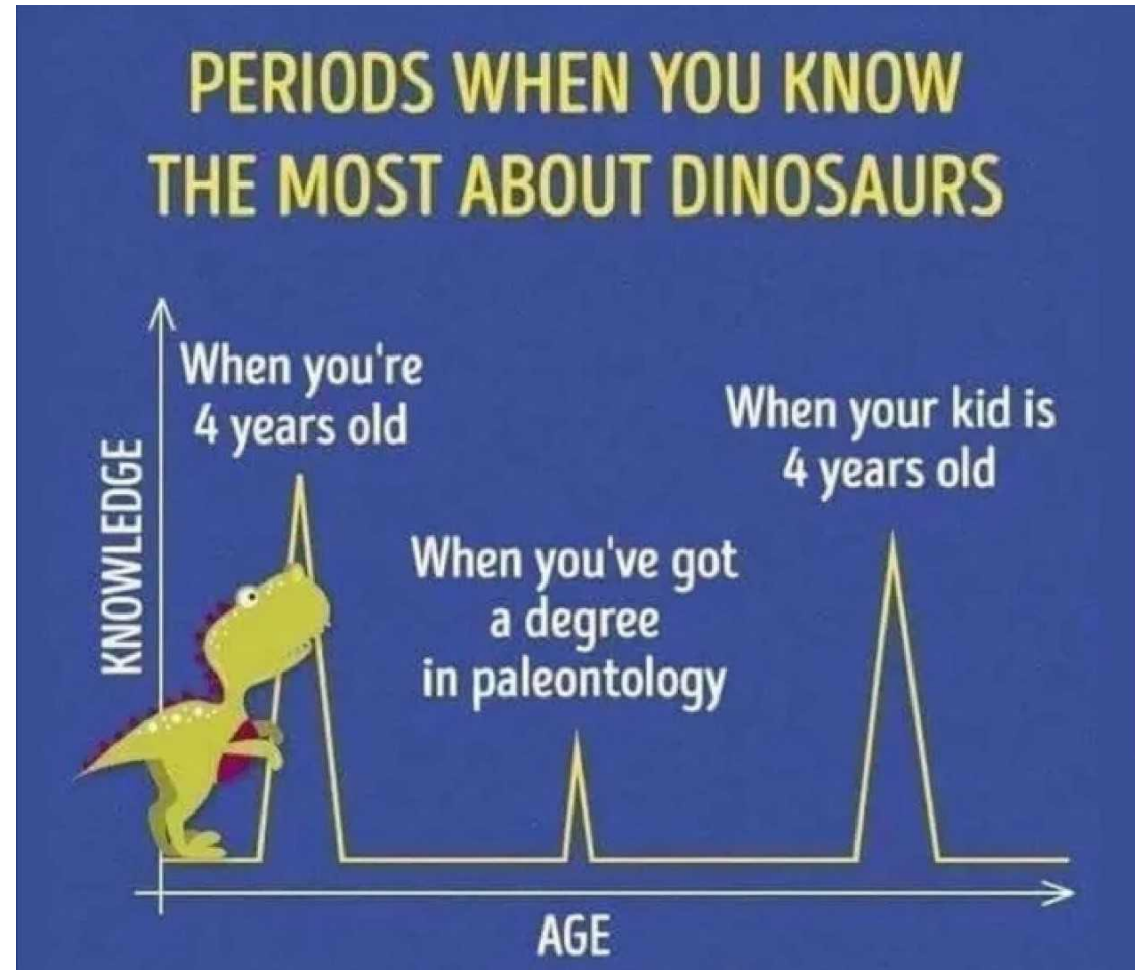
**“Why do we have to wait for
the picture?”**



But people stop asking questions as they get older....



Keep asking questions like a child





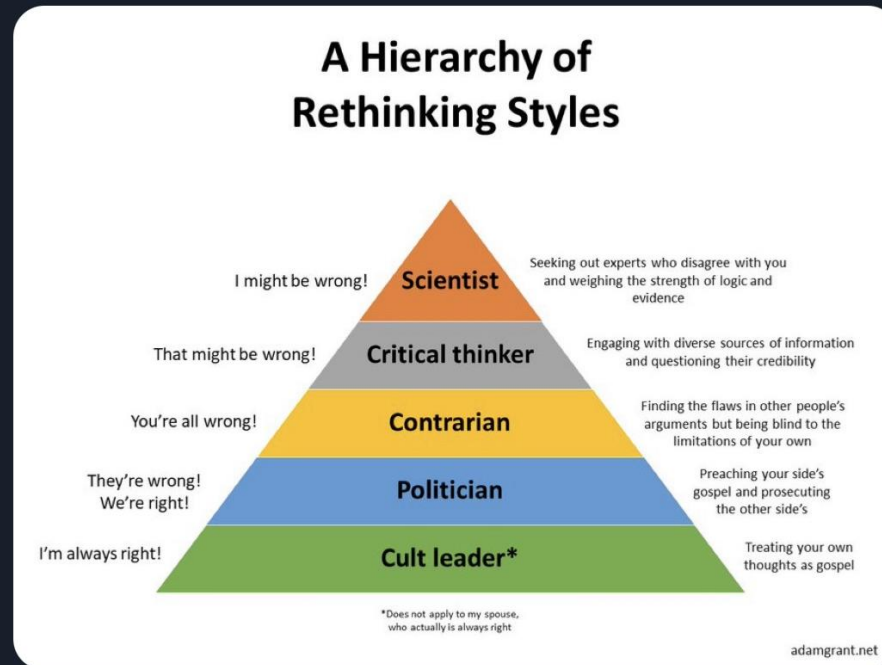
Adam Grant 
@AdamMGrant



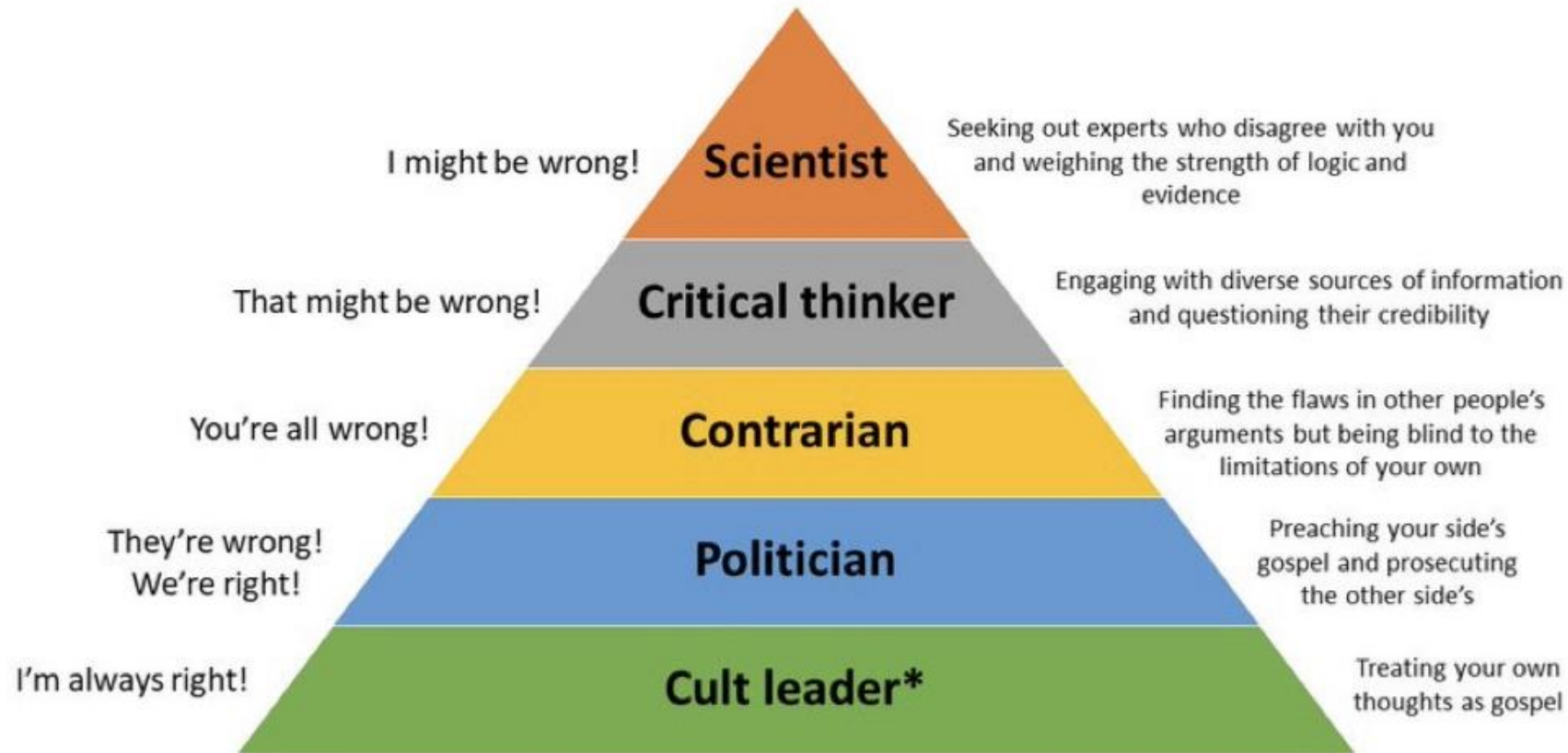
The world could use more people who think like scientists... or at least more critical thinkers.

[#ThinkAgain](#)

[Tweet übersetzen](#)



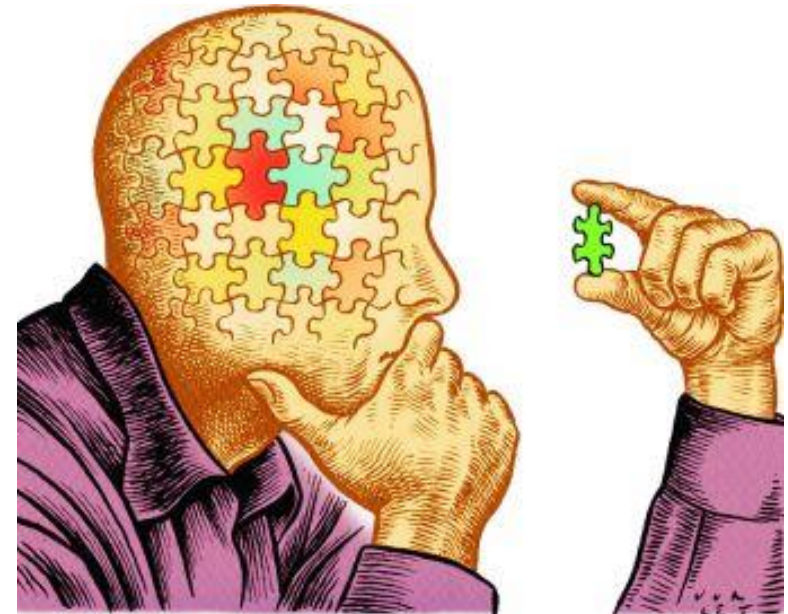
A Hierarchy of Rethinking Styles



*Does not apply to my spouse,
who actually is always right

How to learn critical thinking?

- 1) Look at a trending topic and test yourself.
- 2) Ask: Is this true / accurate?
- 3) How do I know either way? Is there a way I can use data (provable, factual information) to figure out?

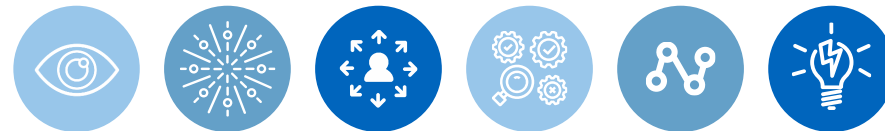


How to develop a good research question

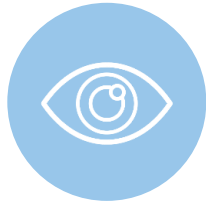


Good research is not only correct, but also interesting to read.

Gray and Wegner defined six principles that help scientists to create more interesting research.

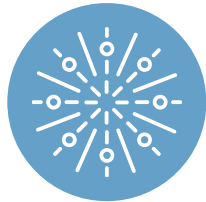


How to *choose* your research question



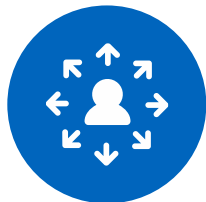
Put phenomena first, not theory

Engaging research ideas are typically not derived from theory, but from finding and observing interesting, “real world” phenomena.



Be surprising, be counterintuitive

Predictable results tend to be unexciting. This may be avoided by either widening the scope of the hypothesis or by reversing the hypothesis in order to generate less intuitive and more surprising outcomes.



Address a wide audience

This not only avoids “toe-stepping” inside a subfield but may also maximize long-term impact of a paper.

How to *answer* your research question



Create exciting experiments

Experiments that create a good narrative and/or are in some way “curious, bizarre and outlandish” appeal to a wider readership. Imagining being the participant helps to create more engaging experiments.

“Imagine two ways to test conformity. In the first, participants press a computer key after seeing words on a computer screen. In the second, participants blatantly lie, sabotaging performance on a trivially easy task to answer similarly to others (Asch, 1963). Although both methods are scientifically valid, there is a reason the second is immortalized in textbooks.” (p. 551)



Use simple statistics

Today, complex analysis is enabled through modern statistics software. However, the simpler an outcome, the more enticing it may be. Additionally, simpler outcomes may attract a larger audience.

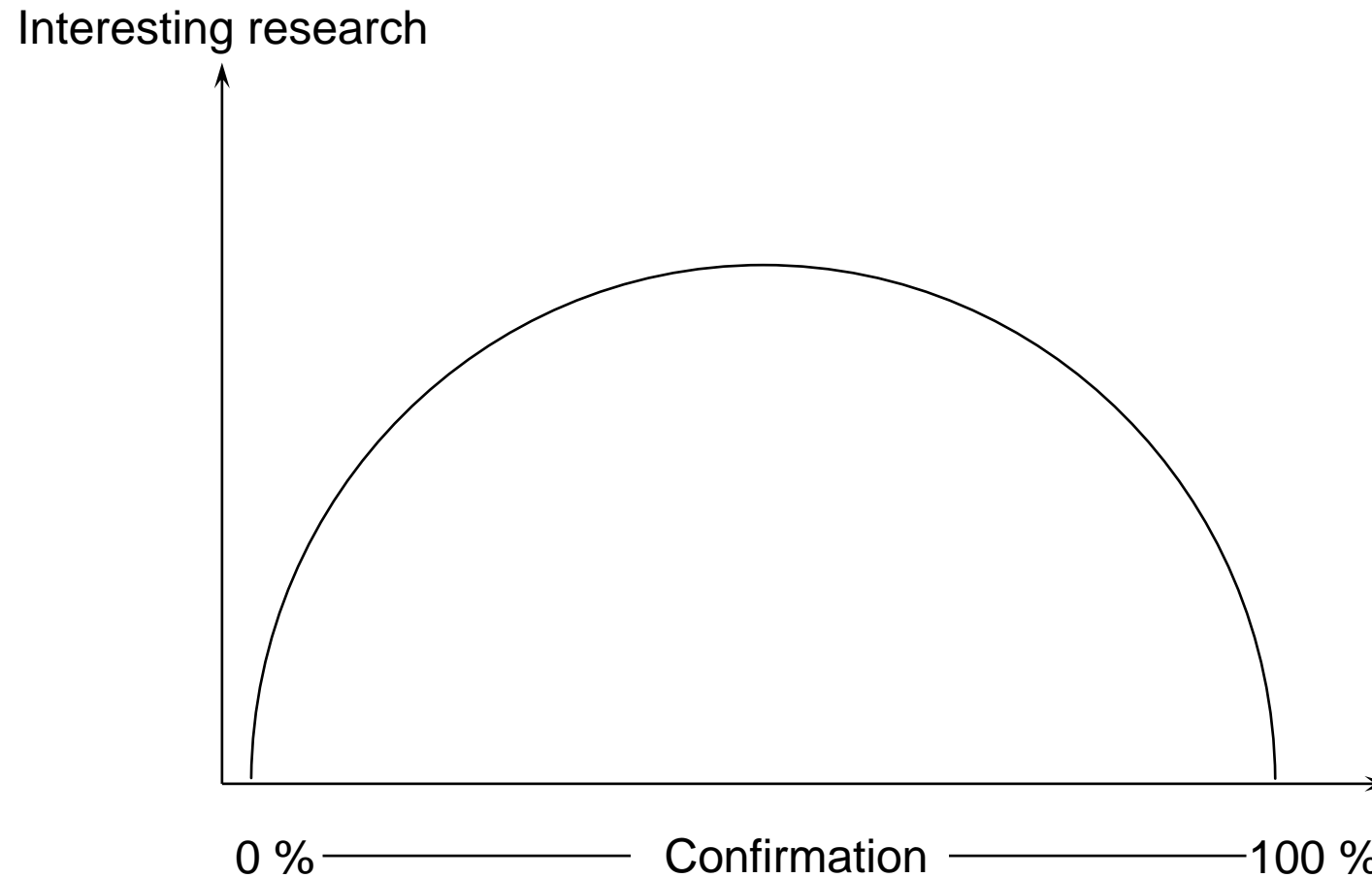
“[...] the all-time best statistic is a single number: in Milgram’s (1963) obedience study, 65% of people went all the way.” (p. 551)



Write a powerful beginning

“First impressions matter”. The first paragraph should summarize the whole paper in everyday language and highlight the phenomenon and its importance.

Disconfirm some (but not all!) existing assumptions



Exercise! Generate an interesting research topic

