Hypothesis = Mechanistic model

based on current knowledge:
- What variable(s) influence y?
- In what way? Linear/non-linear relationship?
- How much? e.g. effect sizes
- How consistent ? e.g. variance, background noise

based on specific study:
- Enough statistical power?
- What are the model predictions?
- Is the model appropriate, assumptions?
- Alternative models?

Knowledge gap

Research question

Model check & predictions

Explore potential and limitations

Fake dataset

Data simulation:
manipulating sample size,
effect size, variance, etc.

Verbal/conceptual hypothesis

Mechanistic model

Formulation of mathematical model
Objectivising the hypothesis

Scientific Knowledge/Literature

Conclusion

Stats/Analysis

Experiment/empirical data gathering

Cognitive biases
e.g. confirmation bias

Publication bias
e.g. selective reporting,
only significant results

Overconfident,
yes/no simplification

HARKing

(hypothesizing after the results are known)

p-hacking
Garden of the forking paths

Mathematical artefact
e.g. regression to the mean

Poor design, limited sample size

Not meaningful/testable (vague, subjective,
unrealistic, multidirectional or without
direction), i.e. the null hypothesis gets
rejected in all cases