

# Two Studies, one Result: Student Teachers are Biased by Anchors When Engaging With Evidence

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Paper Presentation EARLI SIG 18 | 07.09.2022

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# Evidence-Informed School Practice

# Evidence-Informed School Practice

- Teachers are encouraged to consider a great variety of **evidence** ranging from **formal or informal generated raw data** to **results of educational research** in their professional actions (European Commission of the European Communities, 2007; Schildkamp, 2019).
- Both concepts, **data-based decision-making** and **research-informed educational practice**, can complement each other and can be combined under the overarching approach of **evidence-informed practice** (Brown et al., 2017; Brown et al., 2022).
  - Advantages of **data-based decision-making** (Mandinach & Schildkamp, 2021):
    - Individual data basis
    - Reactions to the subjective needs of the students as well as the specific school situations
  - Advantages of **research informed educational practice** (Bromme et al., 2014; Flood & Brown, 2020; Stark, 2017):
    - As an external input
    - Critical reflection on professional actions
    - Legitimation and justification of decisions

# Anchoring Effects

# Anchoring Effects

- Anchoring = **a numeric judgment is assimilated to a previous known standard** (Mochon & Frederick, 2013; Tversky & Kahneman, 1974)
- Different theories exist how anchoring occurs → mechanisms behind the anchoring effect are not completely clarified (Röseler et al., 2022)
- Some results of previous research:
  - Anchoring effects can be found even after a longer period of time (Mussweiler, 2001; Yoon & Fong, 2019)
  - Expertise does not necessarily prevent from Anchoring (Dünnebier et al., 2009)
  - Relevant anchors lead to larger effects than random anchors (Röseler et al., 2022)
- "A better understanding of these heuristics and of the biases to which they lead could improve judgments and decisions in situations of uncertainty". (Tversky und Kahneman, 1974, p. 9)

# **Study 1: Anchoring Effects in Engagement with Data Q**

# Sample

*N* = 68 student teachers from the Karlsruhe University of Education

- 70.59 % female student teachers
- $M_{\text{semesters}} = 4.73$  ( $SD = 3.02$ )
- 69.12 % of the students studied at least one STEM subject




# Design and Materials

Randomized Controlled Trial with two experimental groups: *small anchor* and *small to large anchor*



**Datenerhebung: Tiefseeforscher\*innen**

Wie viele Tiefseewesen sollten die Forscher\*innen Ihrer Intuition nach zunächst untersuchen? (Die Forscher\*innen können auch noch nach einer Sichtung der ersten Ergebnisse, beliebig viele weitere Tiefseewesen untersuchen.)  
**Wie viele untersuchen?**


 untersuchen!

Virtual experiment 1 - open text box

**Datenerhebung: Fr. Maier**

Wie viele Eltern sollte Fr. Maier Ihrer Intuition nach zunächst befragen? (Fr. Maier kann auch noch nach einer Sichtung der ersten Ergebnisse, beliebig viele weitere Eltern befragen.)  
**Wie viele anrufen?**


☐ 4  
☐ 8  
☐ 16

 anrufen!

Virtual experiment 2 - Intervention group 1 with small sampling options

**Datenerhebung: Fr. Müller**

Wie viele Schüler\*innen sollte Fr. Müller Ihrer Intuition nach zunächst testen? (Fr. Müller kann auch noch nach einer Sichtung der ersten Ergebnisse, beliebig viele weitere Schüler\*innen testen.)  
**Wie viele testen?**

 testen!

Virtual experiment 3 - open text box

## Datenerhebung: Tiefseeforscher\*innen

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 untersuchen!

Virtual experiment 1 - open text box

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Wie viele anrufen?

- ☐ 5  
☐ 50  
☐ 100  
☐ 200

 anrufen!

Virtual experiment 2 - Intervention group 2 with small to large sampling options

## Datenerhebung: Fr. Müller

Wie viele Schüler\*innen sollte Fr. Müller Ihrer Intuition nach zunächst testen? (Fr. Müller kann auch noch nach einer Sichtung der ersten Ergebnisse, beliebig viele weitere Schüler\*innen testen.)

Wie viele testen?


 testen!

Virtual experiment 3 - open text box

**Datenerhebung: Tiefseeforscher\*innen**

Wie viele Tiefseewesen sollten die Forscher\*innen Ihrer Intuition nach zunächst untersuchen? (Die Forscher\*innen können auch noch nach einer Sichtung der ersten Ergebnisse, beliebig viele weitere Tiefseewesen untersuchen.)

**Wie viele untersuchen?**


 untersuchen!

Virtual experiment 1 - open text box

**Datenerhebung: Fr. Maier**

Wie viele Eltern sollte Fr. Maier Ihrer Intuition nach zunächst befragen? (Fr. Maier kann auch noch nach einer Sichtung der ersten Ergebnisse, beliebig viele weitere Eltern befragen.)

**Wie viele anrufen?**

 anrufen!

Virtual experiment 2 - Control group with open text box

Virtual experiment 3 - open text box

# Design and Materials

Randomized Controlled Trial with two experimental groups: *small anchor* and *small to large anchor*



# Hypotheses

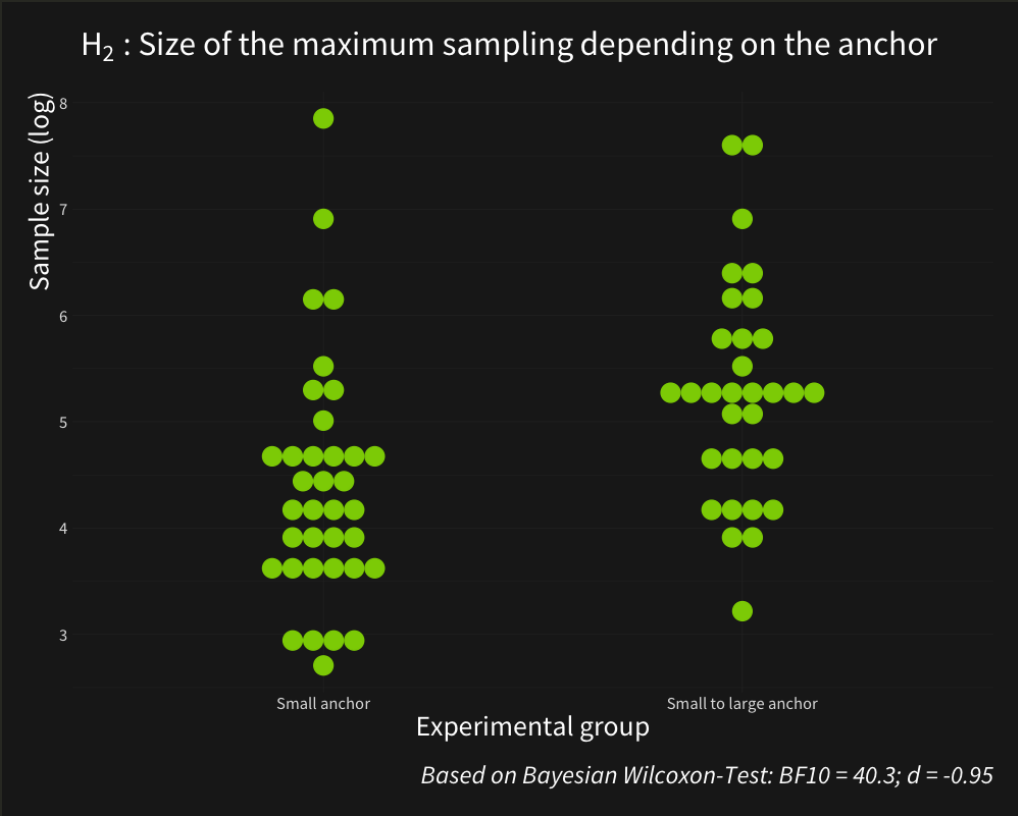
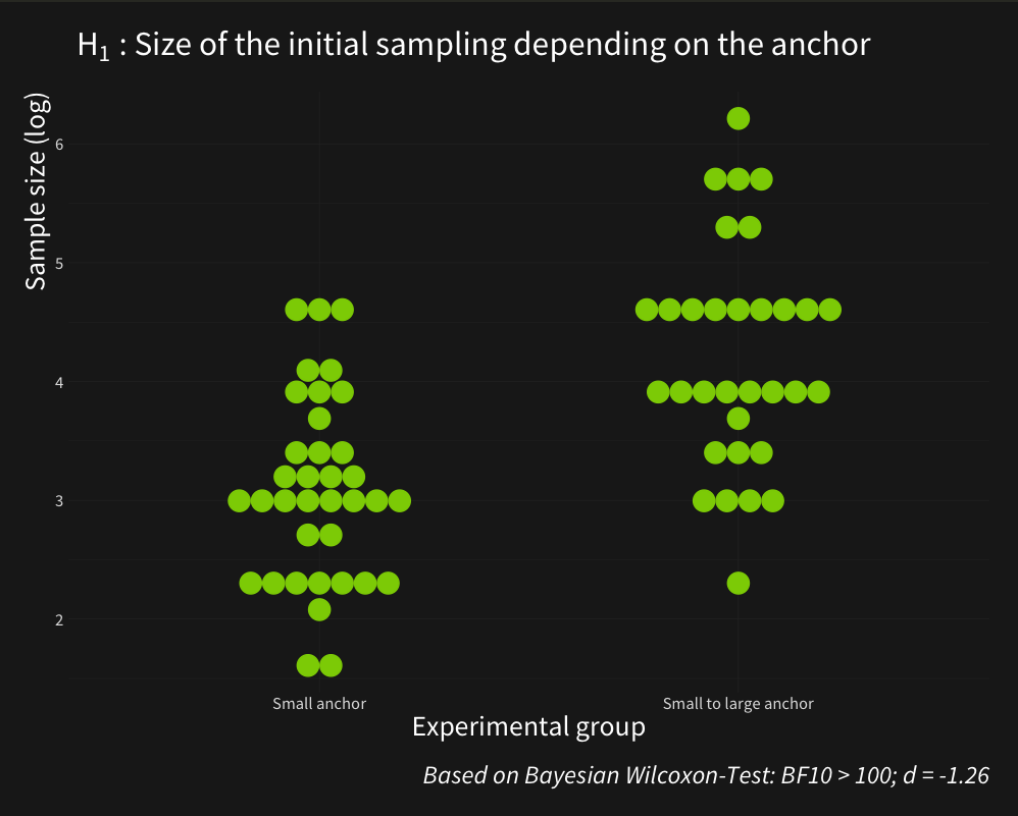
H<sub>1</sub>: Small sampling options in the second experiment (working as a small anchor) are leading to smaller initial samplings in the third experiment than small to large sampling options (working as a small to large anchor).

H<sub>2</sub>: Small sampling options in the second experiment (working as a small anchor) are leading to smaller maximum samplings in the third experiment than small to large sampling options (working as a small to large anchor).

$$H_1: \mu_{\text{small samples}} < \mu_{\text{small to large samples}}$$

$$H_2: \mu_{\text{small samples}} < \mu_{\text{small to large samples}}$$

# Results



# **Study 2: Anchoring Effects in Interpreting Scientific Evidence Q**



# Sample

*N* = 233 student teachers from the Karlsruhe University of Education

- 85 % female student teachers
- $M_{\text{semesters}} = 3.36$  ( $SD = 1.28$ )
- 70.81 % of the students studied at least one STEM subject

Randomized Controlled Trial with two within-person factors *topic of educational research* and *sample size*

Below you will find a brief study description. Please read it carefully and then answer the following questions.

Study description:

*A group of educational researchers asks whether discovery learning (e.g., students conduct their own research on scientific issues, conduct experiments, interpret the results) enables more effective learning. Therefore, they investigate whether students learn better in a lesson with discovery learning than students in a teacher-centered lesson (direct instruction by the teachers, e.g. experiments are demonstrated by them).*

*For this purpose, they conduct the following experiment: The researchers randomly select two groups with  $N = 15$  students each. One group attends a lesson with discovery learning on the topic "astronomy", the other group attends a teacher-centered lesson on the same topic. After the respective lesson, students take a test to check how much they have learned on the topic of astronomy.*

**What do you think?**

The described approach is suitable to answer the research question.

totally disagree  totally agree

The number of sampled students ( $N = 15$  in each group) in the presented study is appropriate to answer the research question.

totally disagree  totally agree

Randomized Controlled Trial with two within-person factors *topic of educational research* and *sample size*

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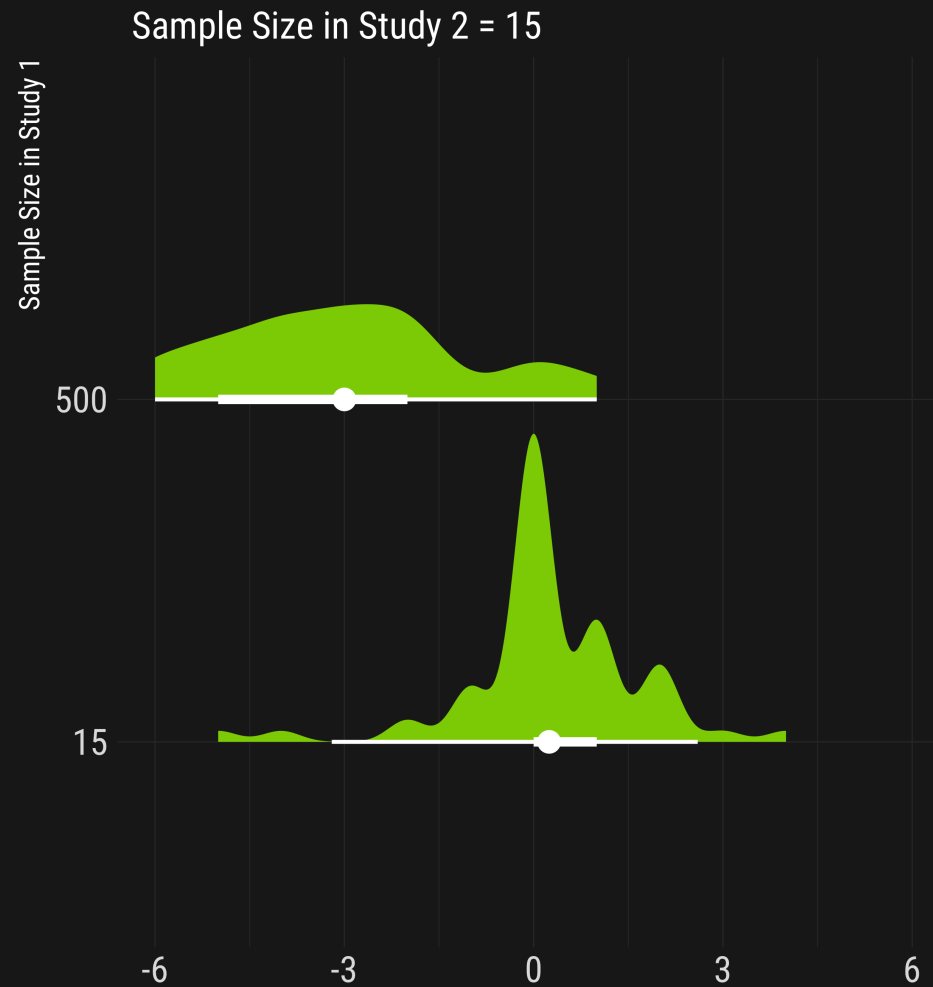
# Hypothesis

- a) Taking into account the appropriateness rating of sample size 1, the **experimental group 1** rates the presented **sample size 2 as more appropriate** than the experimental group 2. (or vice versa: Taking into account the appropriateness rating of sample size 1, the **experimental group 2** rates the presented **sample size 2 as less appropriate** than the experimental group 1.)
- b) Taking into account the appropriateness rating of sample size 1, there is **no difference in the appropriateness rating of sample size 2** between the **control group 1 and control group 2**.

$$H_1: \mu_{EG1} > \mu_{EG2} \text{ \& } \mu_{CG1} = \mu_{CG2}$$

experimental group 1 (EG1):  $N_1=15$  (small anchor),  $N_2=500$   
experimental group 2 (EG2):  $N_1=500$  (large anchor),  $N_2=15$   
control group 1 (CG1):  $N_1=15$ ,  $N_2=15$   
control group 2 (CG2):  $N_1=500$ ,  $N_2=500$

# Graphical Overview of the Results



Based on Bayesian ANOVA:  $BF_{10} > 100$

# Discussion

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- Both studies indicate evidence for anchoring effects on student teachers' engagement with different types of evidence.

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One example for anchoring effects in **evidence-informed practice**

- Large-scale assessments (e.g., PISA) might act as an anchor resulting in a devaluation of scientific evidence based on smaller sample sizes
- → sample sizes are not the only indicator of quality and validity



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# Thank you for your attention!

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