

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

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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

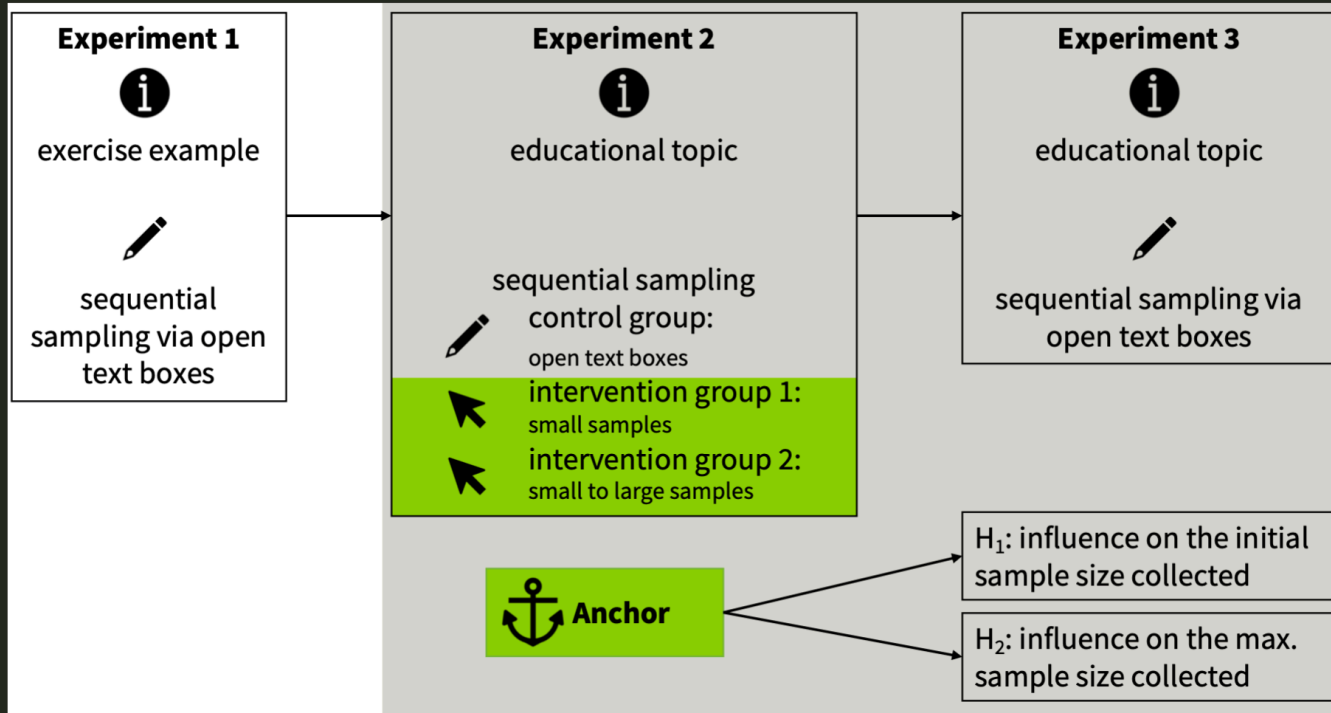
Sample

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

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

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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

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.)

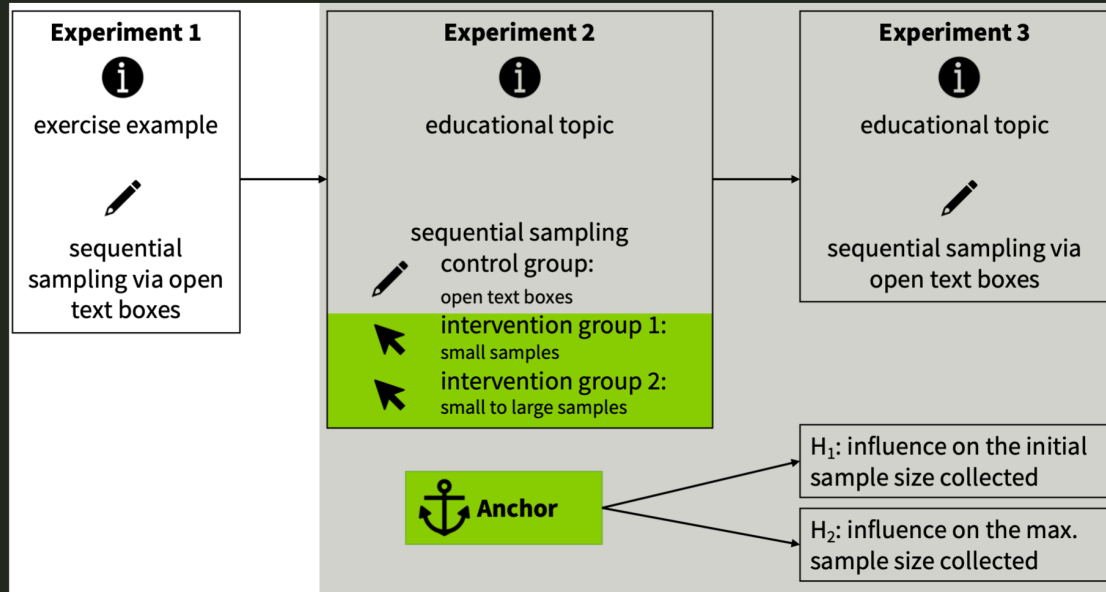
Wie viele testen?

 testen!

Virtual experiment 3 - open text box

Design and Materials

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



Hypotheses

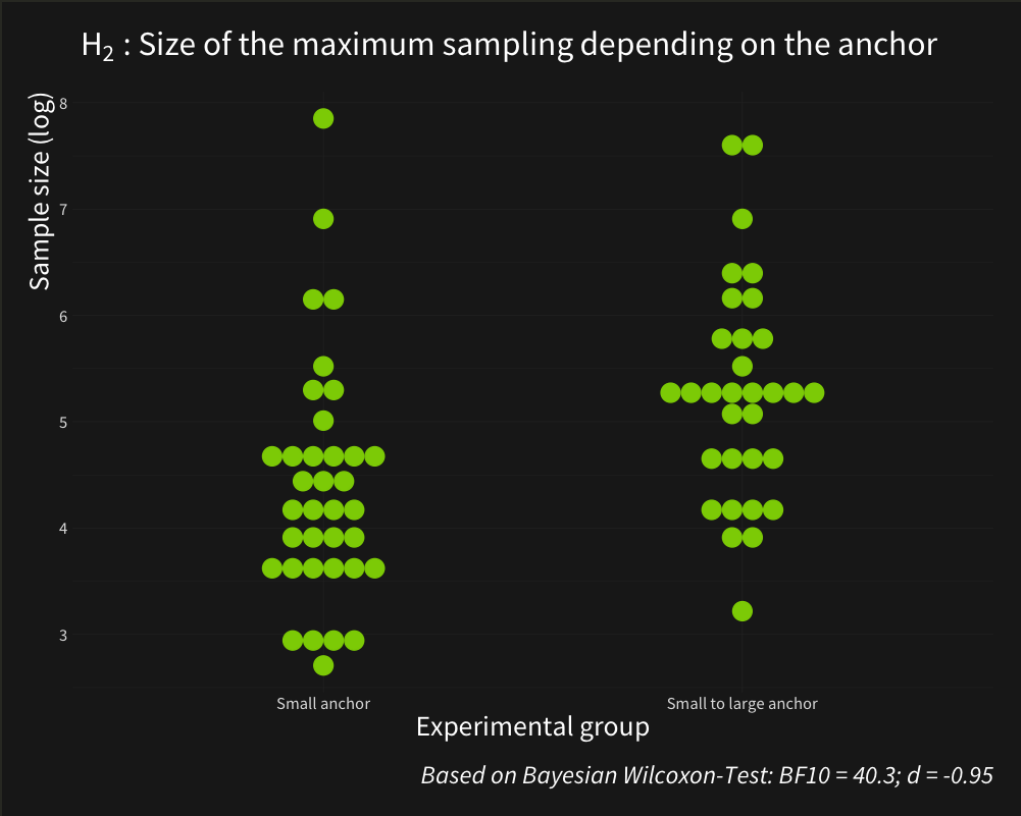
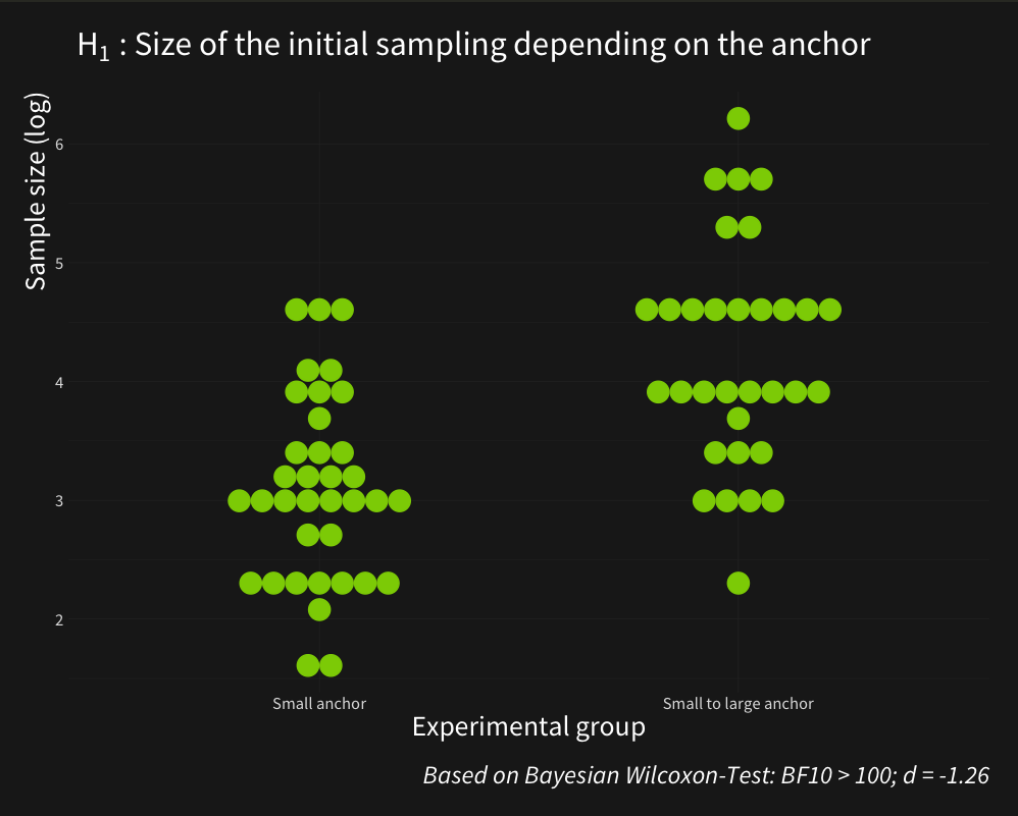
H₁: Small sampling options in the second experiment (working as a small anchor) are leading to smaller initial samplings in the third experiment than small to large sampling options (working as a small to large anchor).

H₂: 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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What do you think?

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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

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

Discussion

- 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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