The Curious Case of the Question Mark

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1. Take-away
An A/B test in Math Garden showed that delaying access to a problem-skipping option increases effortful practice.

2. Good to know

**Math Garden** - A computer adaptive practice system for arithmetics, actively used by over 150,000 primary school children.

**A/B test** - An online randomised field experiment that usually involves hundreds of thousands of participants (also see box A).

**Effortful practice** - Practice that involves deliberate effort and a risk of failure. Important for learning.

3. The problem
In Math Garden, some children skip problems **without taking the effort** to solve them.

One possible reason: obsession with collecting virtual coins (requires fast correct responses).

4. Our solution
Delay appearance of the question mark by 3, 6, or 9 seconds (default is 0 seconds). This is the **minimum toil time**. Experimental details in box B.

5. Results
Fewer question mark responses:

6. Should you care?
We think so. This is why:

* Intervention is **minimally invasive**.
* Yet, children seem to **exert more effort** (see box C).
* Potentially affects 150,000 children.
* Minimum toil time might be advantageous in other settings.
* We love **reliability**: many participants & cross-validation is postponed until after acceptance, to shift focus to the quality of the methods.

**2. Good to know**

**Example**: $9 \times 9 = \ldots$

**Box A. Are A/B tests pure awesomeness?** Definitely.
- Massive scale
- High ecological validity
- Double blind
- Minimally invasive

**Box B. The experiment by the numbers.**
- 107,979 participants
- 4 conditions: 0, 3, 6, or 9 seconds delay
- 3 domains: addition, division, 1-2-3
- 14 week experiment span

**Box C. Do children exert more effort?** Probably.
- Fewer question mark responses
- Time on task does not decrease
- Fast guesses are unlikely
- Substitute responses are slow

**Further information**

Title: Delaying access to a problem-skipping option increases effortful practice.
- Read the paper: osf.io/preprints/socarxiv/m6jqe/
- Get in touch: alexandersavi.nl