

Evaluation of Learners' Adjustment of Question Difficulty in Adaptive Practice of Facts

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Main question

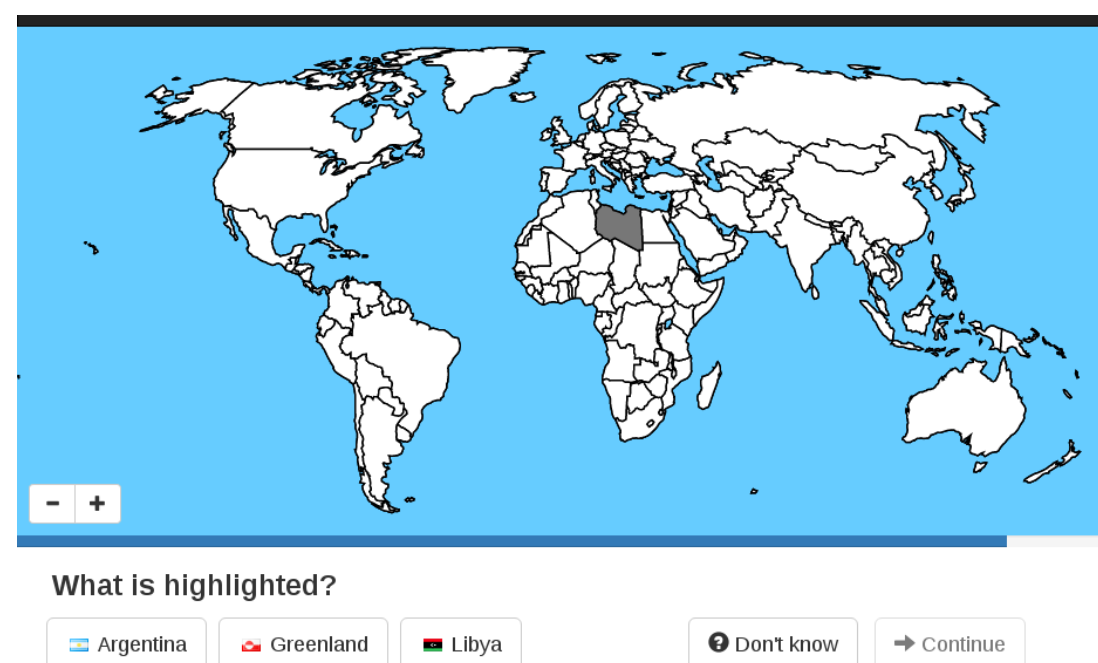
Should we give learners control over difficulty setting in computerized adaptive practice?

Experiment

Outline maps (outlinemaps.org)

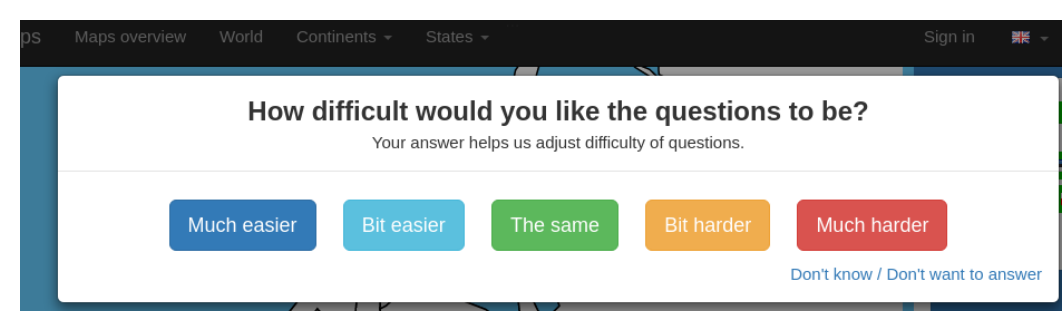
practice of geography facts

adaptive algorithm with a target error rate



Randomized control trial

dialog box after each series of 10 questions



3 conditions:

- normal no dialog box, target error rate 35%
- placebo dialog shown no effect of response
- adjustment dialog shown, response changes target difficulty (-20%, -10%, 0%, +10%, +20%)

85 thousands learners

8 million answers

data available

<http://data.outlinemaps.org/>

Related experiments

Derek Lomas, Kishan Patel, Jodi L. Forlizzi, and Kenneth R. Koedinger. 2013. Optimizing challenge in an educational game using large-scale design experiments. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, 89–98.

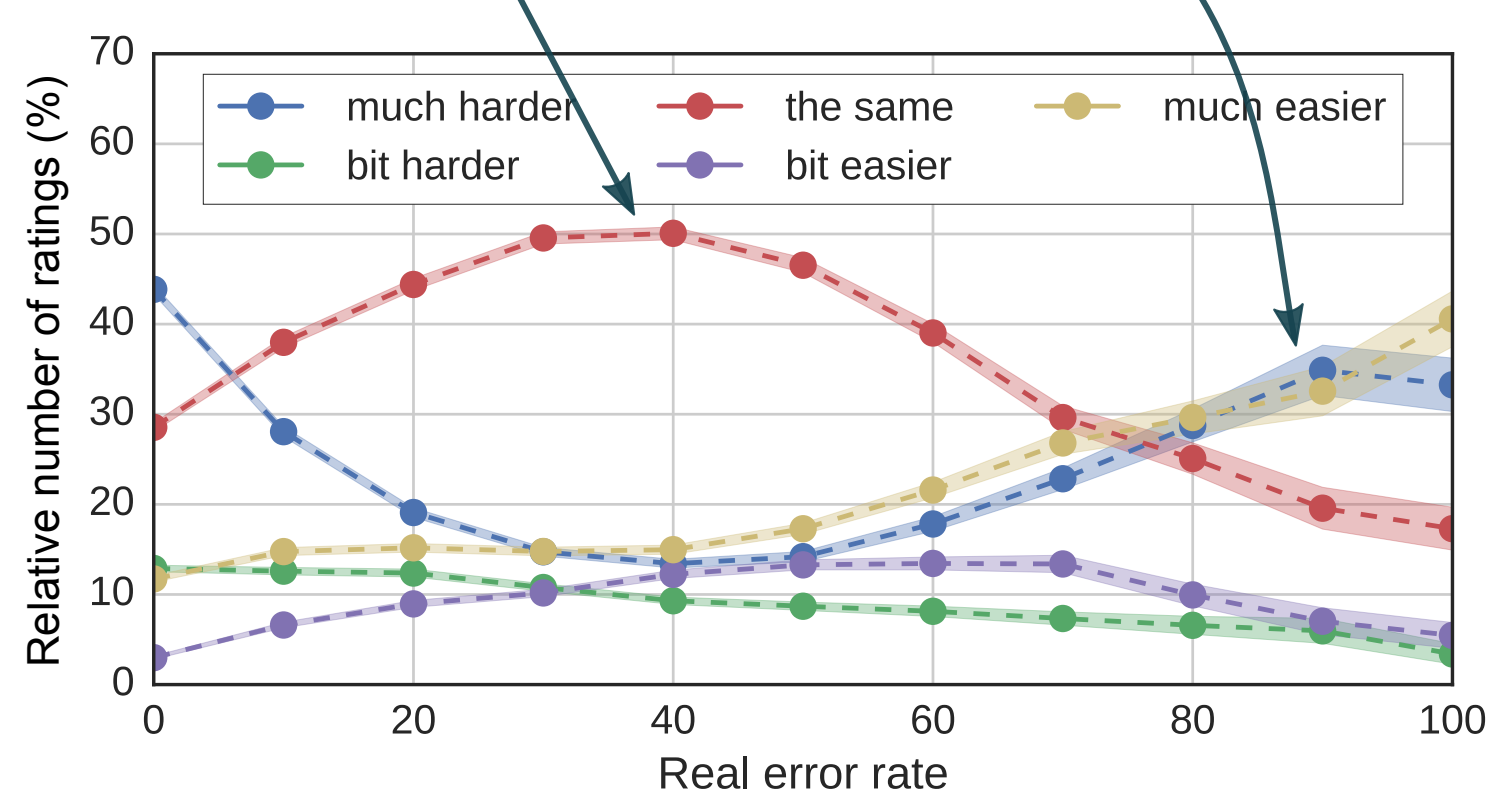
Brenda R.J. Jansen, Abe D. Hofman, Alexander Savi, Ingmar Visser, and Han L.J. van der Maas. 2016. Self-adapting the success rate when practicing math. *Learning and Individual Differences* 51 (2016), 1–10.

Jan Papoušek, Vit Stanislav, and Radek Pelánek. 2016. Impact of Question Difficulty on Engagement and Learning. In *Proc. of Intelligent Tutoring Systems (LNC3)*, Alessandro Micarelli, John C. Stamper, and Kitty Panourgia (Eds.), Vol. 9684. Springer.

Results

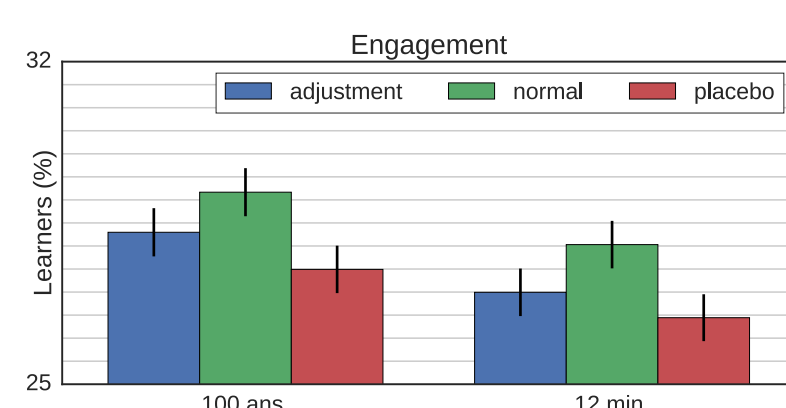
Analysis of learners responses

- systematic irony
- support for target error rate 35%



Engagement

dialog box reduces engagement



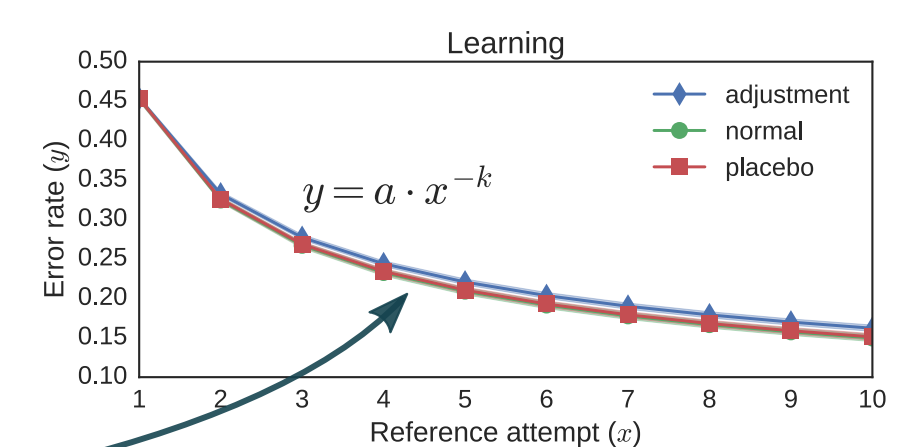
Learning

measured using learning curves over randomized questions

no overall difference

difference for some types of items

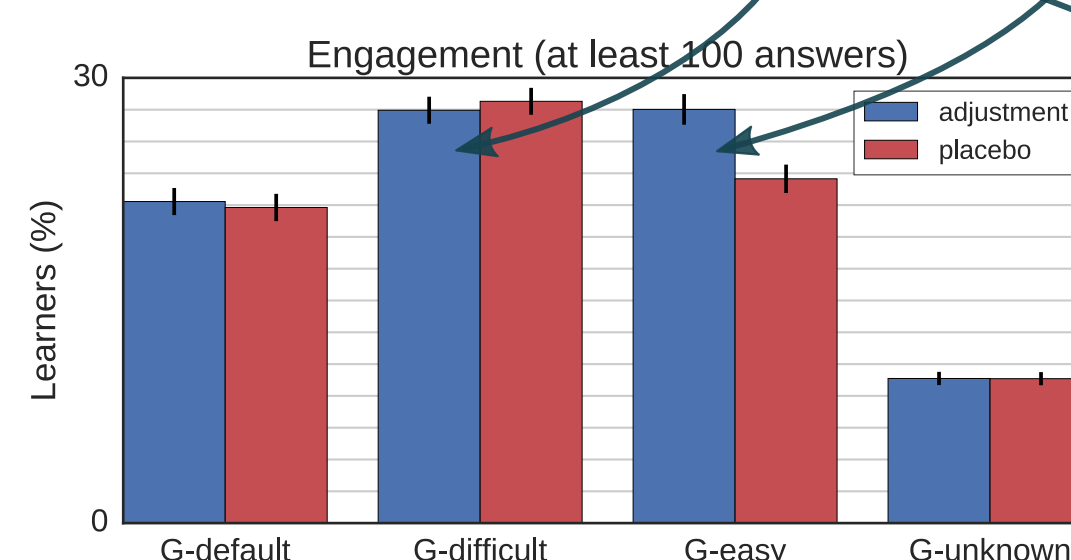
for example 30% easiest maps



Disaggregation of results

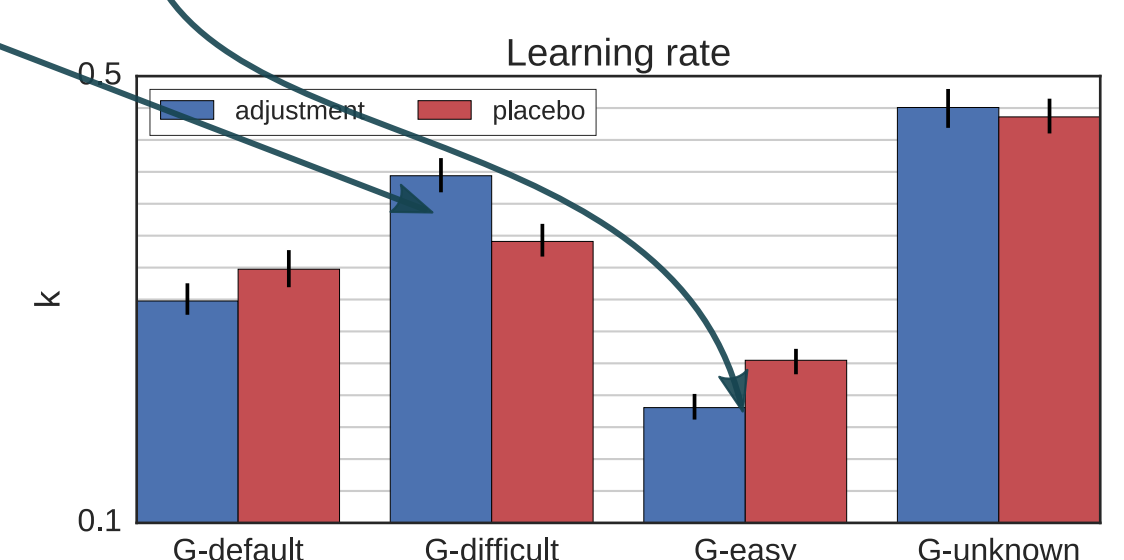
learners who prefer difficult questions

- same engagement
- more efficient learning



learners who prefer easy questions

- better engagement
- less efficient learning



Summary

Small differences in overall results for experimental conditions.

Disaggregated results show significant differences for some groups.

Presence of irony in learners' responses.

Conclusion

Giving learners control over question difficulty is not beneficial.

Adaptive Learning
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