THE EFFECTIVENESS OF ONLINE MATH FACTS TRAINING IN NINTH GRADE STUDENTS FRACTIONS APTITUDE

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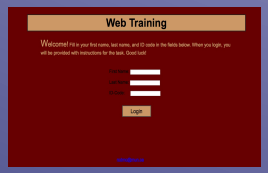
Introduction

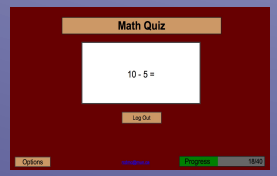
- Current math curricula in elementary school and high school does not prepare students to handle even simple mathematical problems; 61 percent of fourth-grade students and 68 percent of eighth-grade students tested below the level of math competency expected for their grade (Poncy, Duhon, Lee, & Key, 2010).
- Math curriculum in the United States seems to place more emphasis on reasoning (conceptual learning) and less on explicit instruction in math facts as multiplication tables (declarative learning) (Kroesbergen, Van Luit, & Maas, 2004).
- Students trained on declarative-style curriculum demonstrated quicker reaction-times on math problems, suggesting "fluency"; these students showed significantly less frustration on more complex mathematical problems (Poncy, McCallum, & Schmitt, 2010).
- Can explicit instruction on math-facts enhance students' ability to complete more complex problems (e.g., fractions-based problems)?

Purpose

To assess the effectiveness of an online math-facts training program to improve Grade 9 students' ability to solve fraction-based problems

Methods

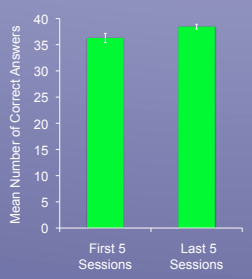


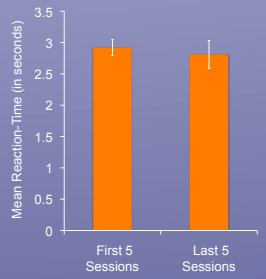


- 43 Grade 9 students initially approached; 25 provided informed consent
- Students were randomly assigned to either experimental group (math-training) or control group (spelling-training)
- After completing pre-test fractions measures, students received ID-codes and directed to appropriate training-programs; each instructed to complete 15 sessions over 3 weeks
- In math-training group, 5 reached completion

	> 15 sessions (n = 5)	1-15 sessions (n =2)	0 sessions (n =4)
Conceptual Pre-test	20.5 (3.15)	16.4 (3.78)	15.18 (3.25)
Conceptual Post-test	18.33 (3.01)	17.25 (2.06)	13.4 (4.99)
Procedural Pre-test	6.67 (3.27)	3.5 (2.08)	3.09 (2.17)
Procedural Post-test	6.5 (1.05)	4.25 (3.10)	3.67 (3.5)

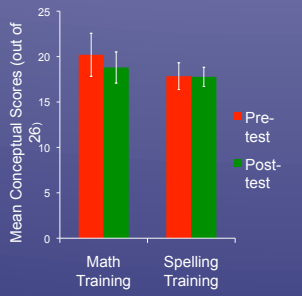
Results

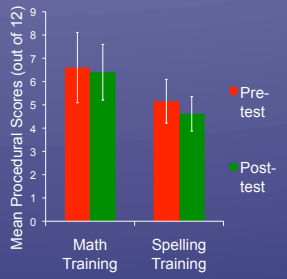




Note: 89 sessions out of 2966 were excluded

Overall, no significant differences were found between pre-test and post-test mean scores, regardless of assigned intervention.
However, training led to significant improvements with regard to number of correct answers, $t(4) = 2.893$, $p = .044$, though it did not lead to significant improvements in reaction-time, $t(4) = 0.357$, $p = .739$





We would like to thank all schools, parents and children who participated

Discussion

- Overall, experimental intervention made no significant improvements, but why?
- Of 43 students, only 25 returned consent forms and could be included in final analyses; 11 in experimental group, 14 in control.
- Of these, only 5 experimental-group students (vs. 13 in control-group) completed 15 sessions. Overall, self-selection may have influenced the composition of the groups.
- Noncompliance possibly due to intimidation or boredom
- Possible only students skilled at math completed training, but not achieving ceiling; maybe math facts mastery can only help so much
- Potential effect dependent on automaticity of math-facts; program likely improved math facts, but not to point of automaticity
- Re-examination of training program in order; make web-application more engaging/entertaining (e.g., animations, storytelling elements, etc.)
- Only based on one school, which is known to be in a lower SES area. More subjects with more variable SES needed.
- Future studies: initial training-sessions supervised, more entertaining web-application, wider sample, more training, have a more explicit automatization goal

References

Kroesbergen, E.H., Van Luit, J.E.H., & Maas, C.J.M. (2004). Effectiveness of explicit and constructivist mathematics Instruction for low-achieving students in the Netherlands. *The Elementary School Journal, 104*(3), 233-251. doi: 10.1086/499751

Poncy, B.C., Duhon, G.J., Lee, S.B., & Key, A. (2010). Evaluation of techniques to promote generalization with basic math fact skills. *Journal of Behavioral Education, 19* (1), 76-92. doi: 10.1007/s10864-010-9101-x

Poncy, B.C., McCallum, E., & Schmitt, A.J. (2010). A comparison of behavioral and constructivist interventions for increasing math-fact fluency in a second-grade classroom. *Psychology in the Schools, 47*(9), 917-930. doi: 10.1002/pits.20514

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