Evaluation of an Online Tutoring Program in Elementary Mathematics

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Abstract:

Many students struggle with mathematics in late elementary school, particularly on the topic of fractions. In a best evidence syntheses of research on increasing achievement in elementary school mathematics, Pelligrini et al. (2018) highlighted tutoring as a way to help students. Online tutoring is attractive because costs may be lower and logistics easier than with face-to-face tutoring. Cignition developed an approach that combines online 1:1 tutoring with a fractions game, called FogStone Isle. The game provides students with additional learning opportunities and provides tutors with information that they can use to plan tutoring sessions. A randomized controlled trial investigated the research question: Do students who participate in online tutoring and a related mathematical game learn more about fractions than students who only have access to the game? Participants were 144 students from four schools, all serving low-income students with low prior mathematics achievement. In the Treatment condition, students received 20-25 minute tutoring sessions twice per week for an average of 18 sessions and also played the FogStone Isle game. In the Control condition, students had access to the game, but did not play it often. Control students did not receive tutoring. Students were randomly assigned to condition after being matched on pre-test scores. The same diagnostic assessment was used as a pre-test and as a post-test. The planned analysis looked for differences in gain scores (post-test minus pre-test scores) between conditions. We conducted a t-test on the aggregate gain scores, comparing conditions; the results were statistically significant (t = 4.0545, df = 132.66, p-value < .001). To determine an effect size, we treated each site as a study in a meta-analysis. Using gain scores, the effect size was g=+.66. A more sophisticated treatment of the pooled standard deviation resulted in a corrected effect size of g=.46 with a 95% confidence interval of [+.23,+.70]. Students who received online tutoring and played the related Fog Stone Isle game learned more; our research found the approach to be efficacious. The Pelligrini et al. (2018) meta-analysis of elementary math tutoring programs found g = .26 and was based largely on face-to-face tutoring studies. Thus, this study compares favorably to prior research on face-to-face mathematics tutoring with elementary students. Limitations are discussed; in particular, this is an initial study of an intervention under development. Effects could increase or decrease as development continues and the program scales. Although this study was planned long before the current pandemic, results are particularly timely now that many students are at home under shelter-in-place orders due to COVID-19. The approach taken here is feasible for students at home, with tutors supporting them from a distance. It is also feasible in many other situations where equity could be addressed directly by supporting students via online tutors.

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