



**Teachley Market Bay** is an immersive 3D world that teaches place value, multi-digit operations and number sense. Students buy and sell in the marketplace, collect coins, craft furniture, mix paint, and visit friends, all while doing math. The game was developed with funding from the National Institutes for Health (R44GM130197) because early math learning helps prepare students for STEM and health careers.

## Research Design

WestEd led a study where researchers randomly assigned 18 second grade teachers and their students to use *Teachley Market Bay* in their classes (treatment) or teach as normal (control).

- Students in treatment classrooms played *Market Bay* for two ~15-minute sessions/week for at least 10 weeks between December 2020 - June 2021.
- Research questions:
  1. Does student knowledge of mathematics (place value and multi-digit addition/subtraction) change after using the Market Bay app?
  2. Do students' attitudes towards math, perception of their math abilities, and motivation/engagement in math change after using the Market Bay app?

## Participants

Participants included 18 second grade teachers (treatment = 8, control = 10) and their students (n=339) from 16 public and 2 charter schools. Due to the COVID-19 pandemic, the majority of teachers in both conditions participated in either remote learning or some form of hybrid instruction during the study.

## Measures

- All teachers completed weekly logs. Researchers surveyed treatment teachers and interviewed a subset.
- Students completed a standardized math test (NWEA MAP Growth) at pre/posttest, a researcher-developed post-test to assess place value and multi-digit operations, and a survey.
- Students completed all assessments digitally as part of remote learning.



## COVID-19 Context

This study took place during the Covid-19 pandemic, which disrupted typical instruction. All classrooms began the study in remote learning; some transitioned to hybrid learning during the study. Teachers reported having less control over student attendance and participation in activities compared to typical years, which may have impacted findings.

## Major Findings

- 1. Teacher Perceptions.** All teachers reported that it was easy to add *Market Bay* to their instructional schedules and that it was very well-aligned to their math content. Seven of the 8 teachers reported that *Market Bay* improved students' overall mathematics knowledge.  
Four of the teachers noted that students' attitudes toward math improved by using *Market Bay*, with some saying it was especially helpful for students who lacked motivation learning remotely and who were less confident in math.
- 2. Changes in Student Knowledge and Attitudes.** Treatment students scored significantly higher on Part 1 of the proximal assessment - generating and explaining the smallest and largest numbers from 3 digits, a place-value measure ( $t(250)=2.062, p<.05$ ). There were no reliable differences between conditions for the other item types or the standardized assessment. There was, however, a high Intraclass Correlation Coefficient of 0.348 at the level of teacher, suggesting that the teacher was a strong factor in students' performance which may have obscured findings.  
The study design was underpowered, meaning there were not enough classrooms to be able to reliably detect differences between conditions. A fully powered study would have involved 40 classrooms with 20 in each condition. The current study had only 8 treatment classrooms.  
Treatment students showed marginal positive differences in their attitudes towards: enjoyment of math, perceptions of math applications, problem solving and their own math abilities. Most students responded that they would choose to use *Market Bay*, if given a choice; that they found the game easy to use; that it gave them support when they were confused; and that it helped them learn math.
- 3. Teacher feedback.** Most teachers reported that students were very engaged in playing *Market Bay*, especially compared to regular classroom activities; however, many noted that engagement decreased over time. Almost all teachers felt that *Market Bay* was beneficial for their students' math learning, citing the high engagement, positive attitudes towards math, and the teaching of money.