

# Effects of Teaching Through Relevant Contexts on Statistical Literacy: Evidence from a Curricular Experiment

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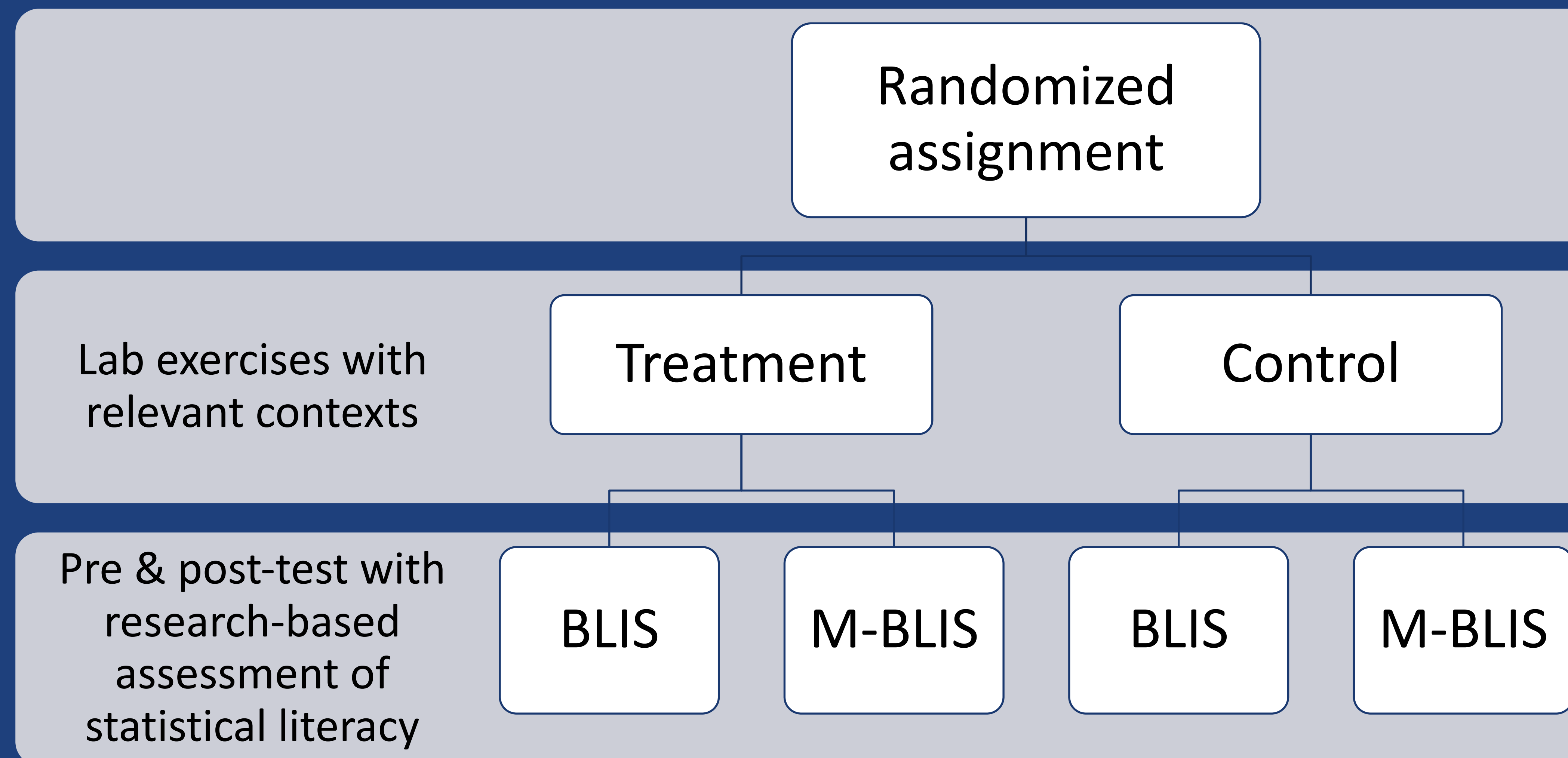
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## RESEARCH QUESTION

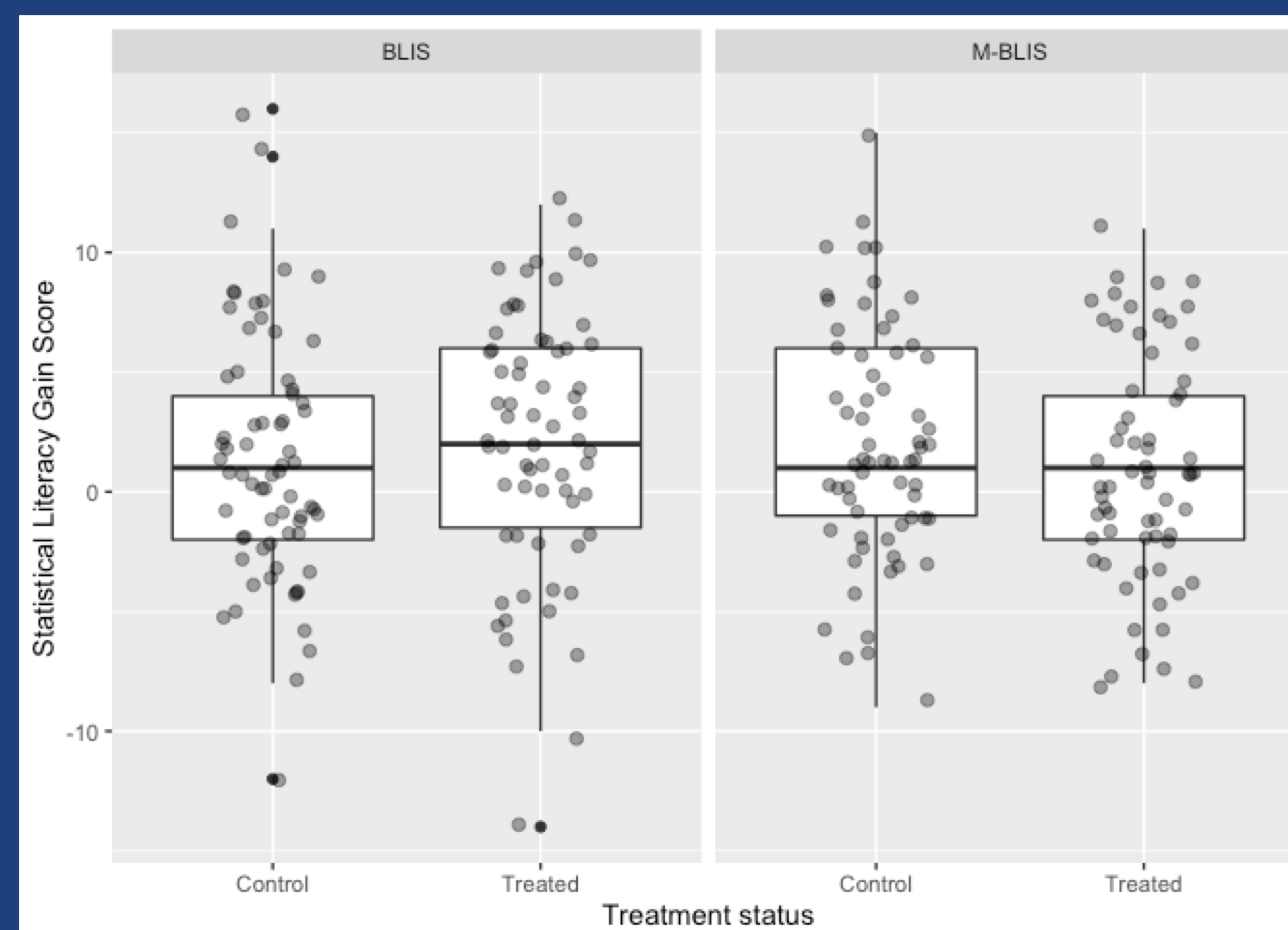
Does including relevant contexts in curricular materials cause a differential gain in students' statistical literacy outcomes?

## METHODOLOGY

- Study conducted in a large enrollment 24 lab section undergraduate introductory statistics class at a large research university (n = 1960)
- Half the lab sections randomly assigned to receive activities based on relevant contexts
  - Relevant context defined as societally relevant at the time and test-takers would have engaged with on their own outside of, and apart from, class
  - 7/25 lab worksheets modified
  - 2/4 labs in confidence interval chapter and 5/5 in hypothesis testing
  - Relevant contexts chosen based on student survey
  - COVID19 pandemic, college student life, education, and mental and physical health
- Students randomly assigned to take one of two research-based assessments of statistical literacy
  - Basic Literacy in Statistics (BLIS) instrument (Ziegler, 2014)
  - Modified BLIS - each non-anchor item based on a context related to the COVID19 pandemic
  - Same instrument for pre and post test
- Statistical literacy gain score – response variable
- Causal effect of the following considered:
  - Lab treatment only (W)
  - Type of assessment only (S)
  - Combination W and S
  - One of the above in a hierarchical linear model (HLM) with varying intercepts for instructors & lab sections, and fixed effects for student covariates
- Causal effects estimated under the potential outcomes framework (Rubin 1974, 2005)

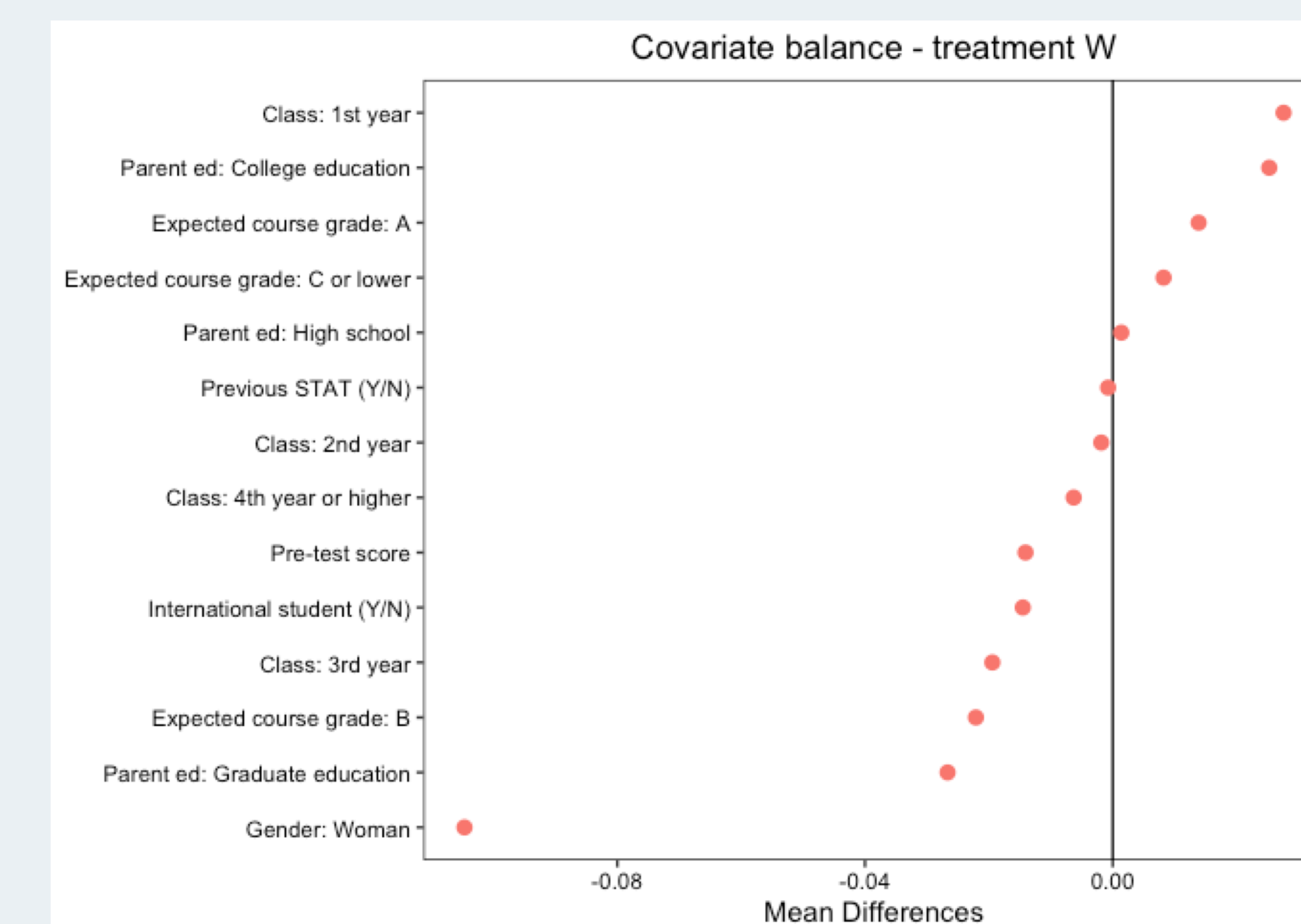


# The causal effect of including relevant contexts in curricular materials on gain in students' statistical literacy outcomes was inconclusive.



## RESULTS

- Due to the difficulty in estimating degrees of freedom for an HLM, results considered with a reference point of t-value = 2
- On their own, neither lab modification nor assessment type affected gain scores
- Interaction of the two had a t-value of 1.4 and a negative estimate
- All of the covariates had a t-value less than 1.5 across all models:
  - Class standing
  - Gender self-identification
  - Previous statistics course (Yes or No)
  - International student (Yes or No)
  - Expected course grade
  - Highest parental education
  - Pre-test score



## TAKEAWAYS FOR TEACHING

- Using research-based assessments in class can provide valuable insight into learning outcomes including statistical literacy
- Randomized experiments, though tedious, will allow for estimating the causal effects of curricular or pedagogical innovations
- Inclusion of relevant contexts in teaching materials can be advantageous no matter the statistical literacy outcomes

## LIMITATIONS

- Study conducted during a pandemic semester when in-person lab attendance NOT required
- Effect size may be limited due to only a subset of activities being modified
- Only one part of the course modified (labs)
- The final dataset only comprised of 10% of the enrollment