



Meta-analysis of Teaching Methods on the FCI and FMCE

Edward Schenk, K Alison Gomez, Chase Shepherd, Tyrel Heckendorf, Adrian M Madsen, Sarah B McKagan, Joshua Von Korff, Eleanor C Sayre

Context

- Meta-analysis of published FCI and FMCE data
- Data compiled from all papers in AJP, PhysRevST-PER and PERC proceedings
 - University level classes in US/Canada (exclude elsewhere and high school)
 - Published 1990-2013
- Institutional Profile
 - Carnegie Classifications (basic and extended)
 - SAT 25th and 75th percentiles for institution, both Math and Verbal

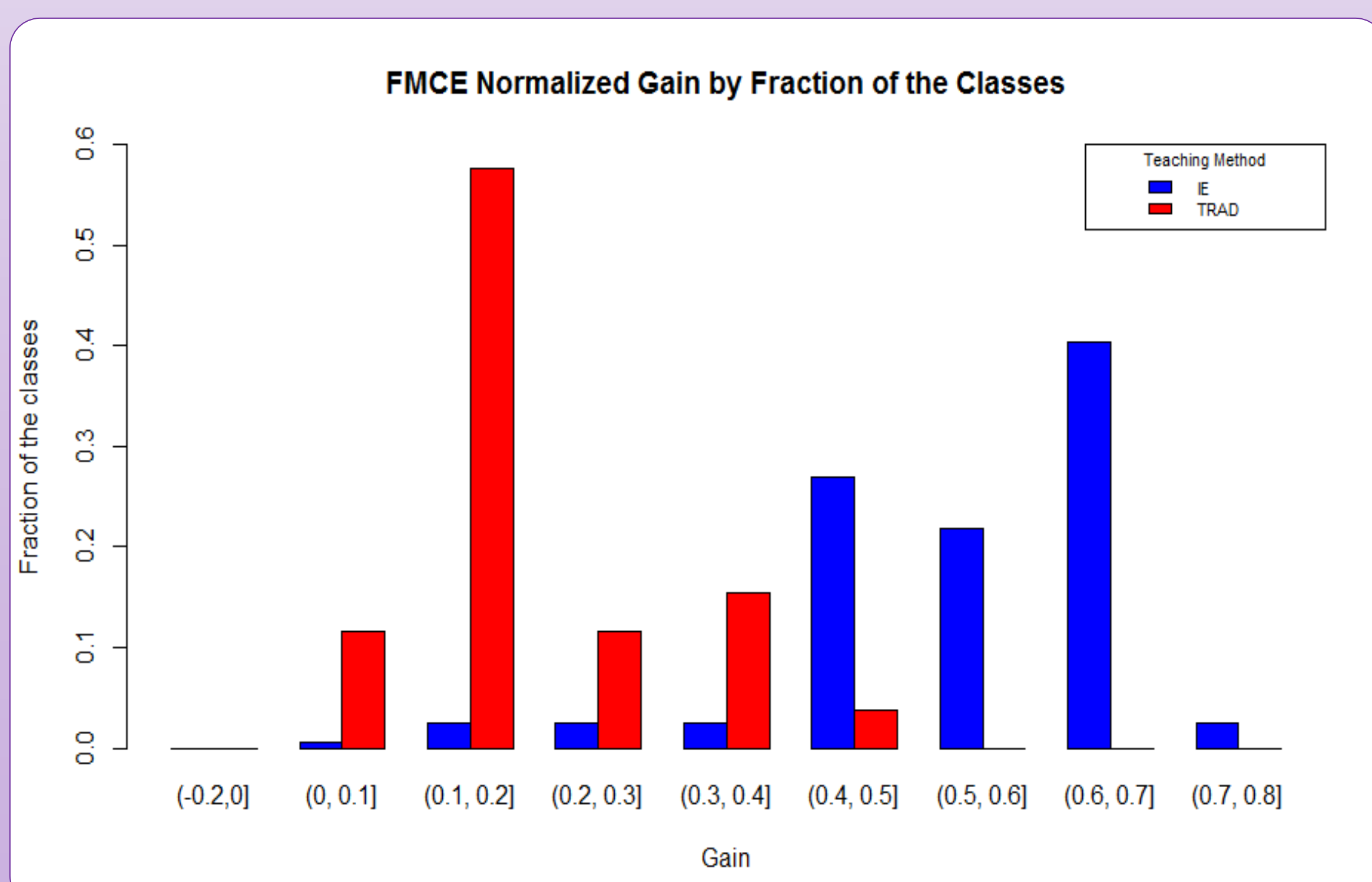
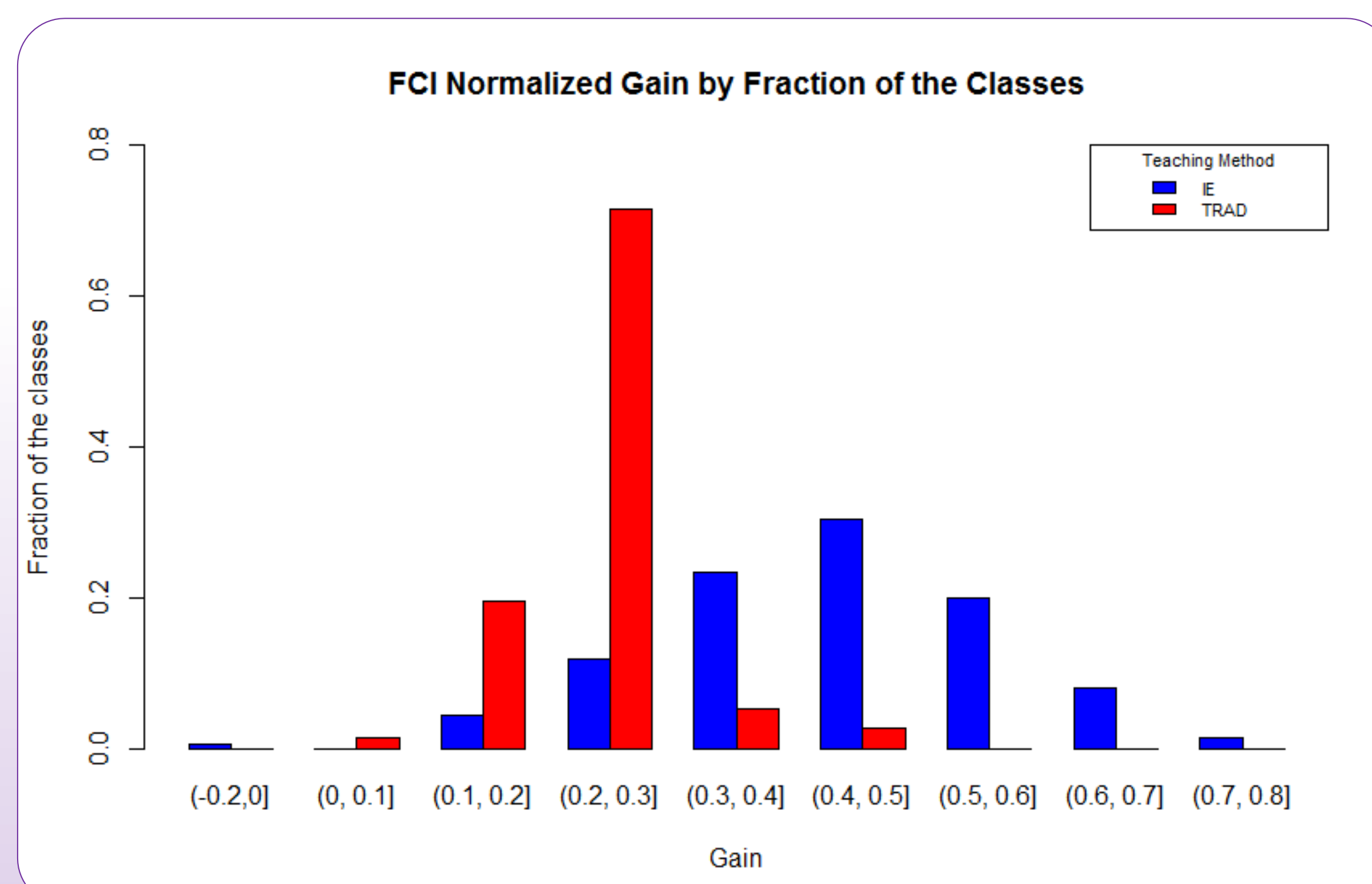
Overview of data set

- 50,000+ students
- 469 classes
- 75 papers
- 52 institutions

Number of classes

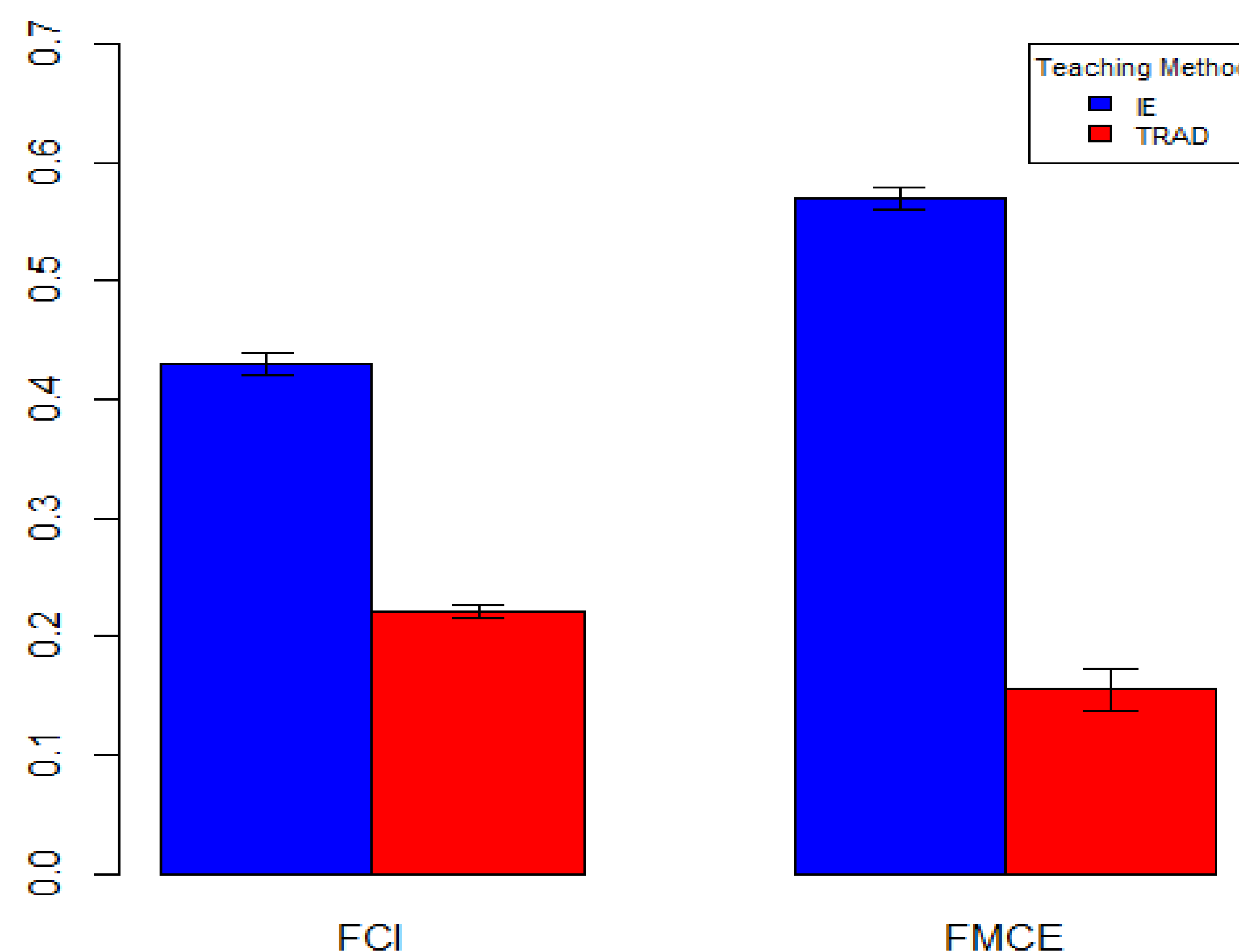
	FCI	FMCE
IE	210	156
TRAD	77	26

FCI and FMCE Test Different Things



- A higher discrepancy in gains between IE and TRAD students exists on the FMCE.
- Traditional methods are differently distributed on the two tests, even if their means are the same.
- IE students test better on the FMCE than the FCI.
- Additional analysis is ongoing.

Normalized Gains



Each pair of bars is significantly different (except traditional bars) according to Tukey HSD test ($p < 0.001$ except traditional $p = .63$).

Institutional Factors

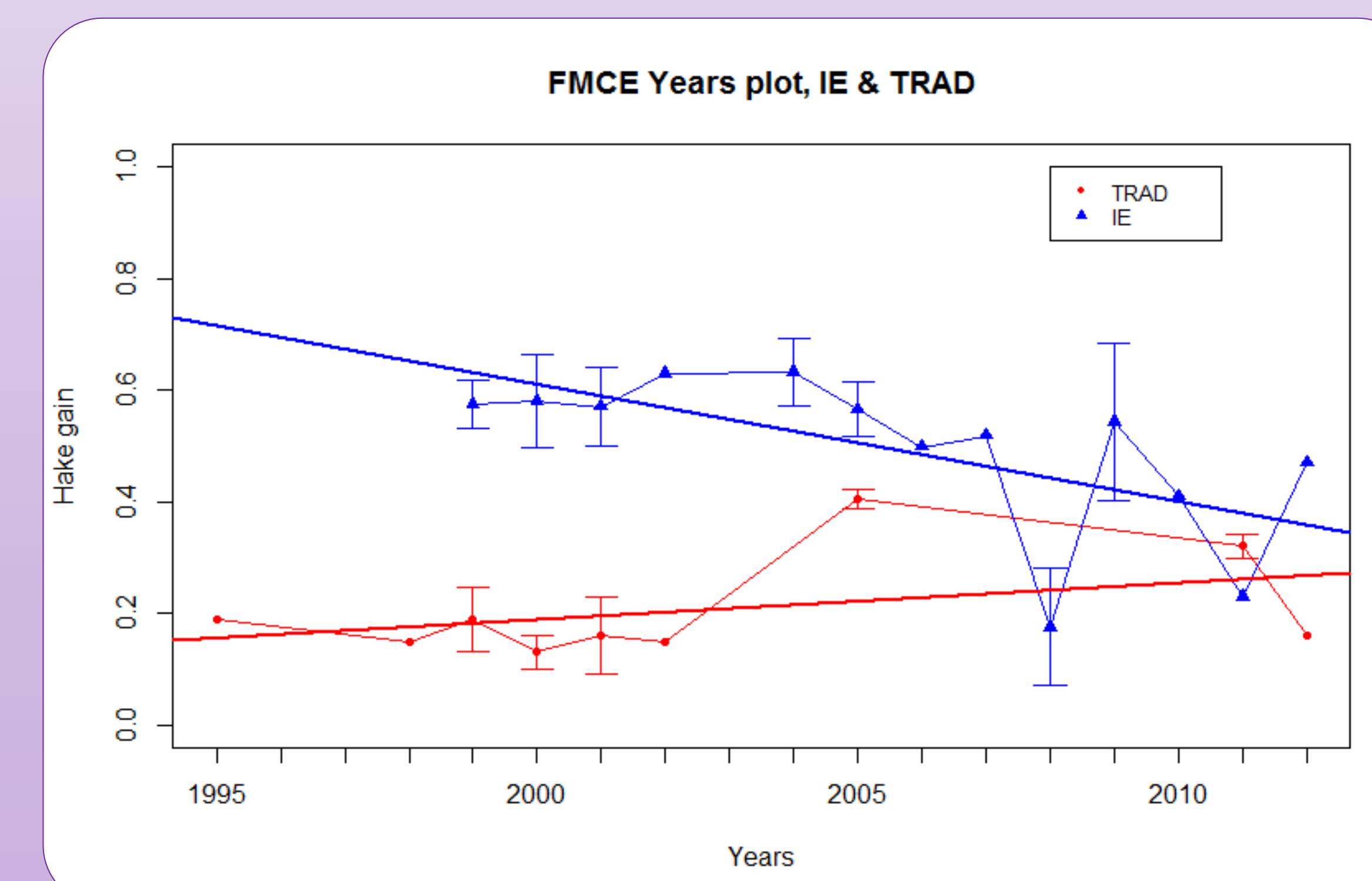
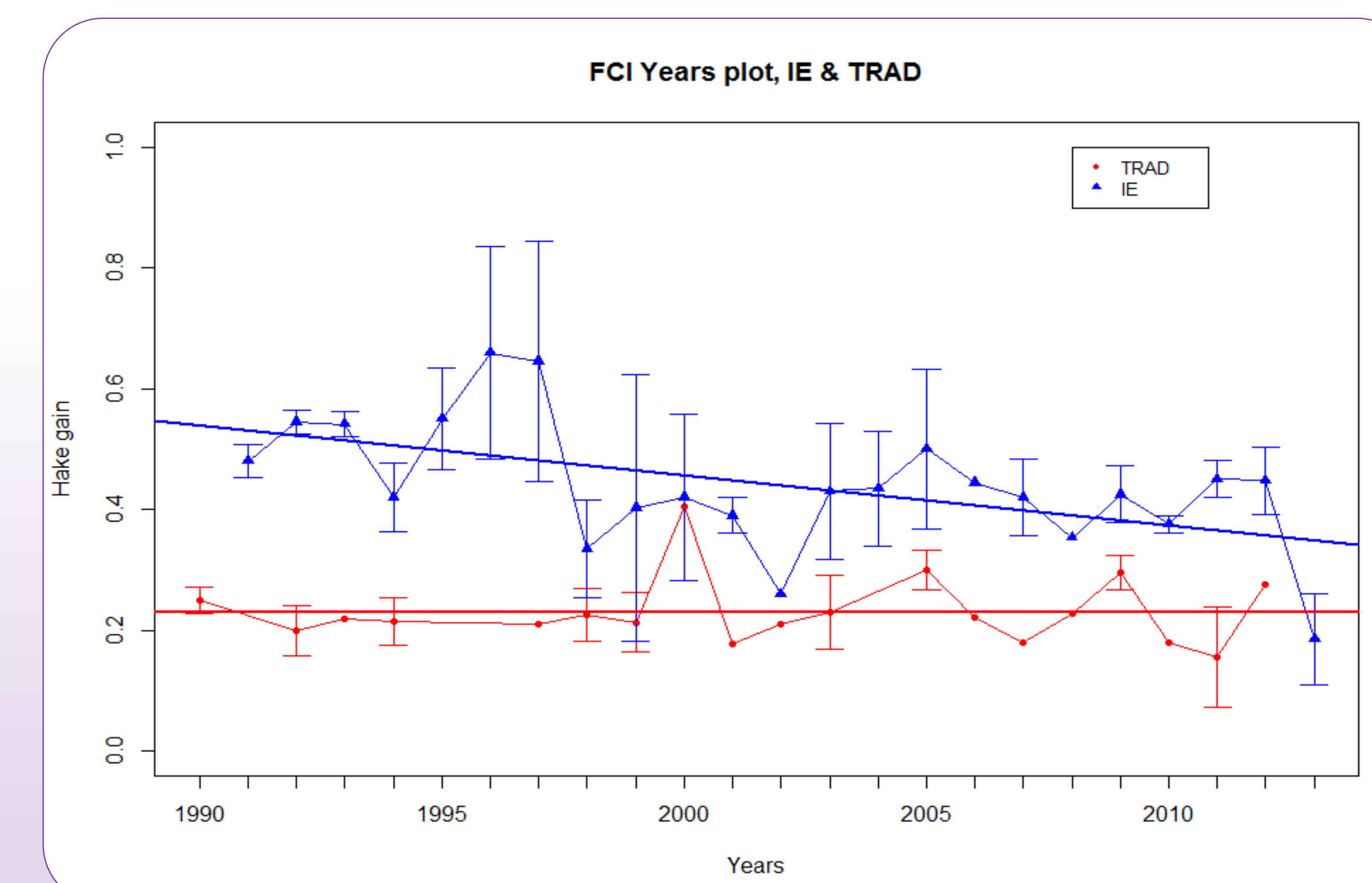
Carnegie Classifications

- Institutions where tests were administered were paired with their Carnegie classifications.
- No correlation was found between student gains and the classifications of the schools.
- Also considered were the highest degree awarded by each institution and the institution's size and setting classification. No correlation between these factors and gain was found.

SAT Scores

- Institutional SAT percentiles for a year when test was administered.
- Renormalized SAT profile to be comparable across years.
- We choose Math 75 percentile as best representation of physics students.
- Percentiles were binned 500-600, 600-700, and 700-800.
- Intervals 600-700 and 700-800 are not significantly different from each other, but are different than 500-600. (Tukey HSD)

Change in Gains Over Time



- IE gains decline over time on both tests.
 - Primary vs. secondary implementations?
 - Gain-as-evidence vs. gain-as-context?
- Traditional gains have held steady.
- Additional analysis is ongoing.