Mastering Mostly Harmless 'Metrics

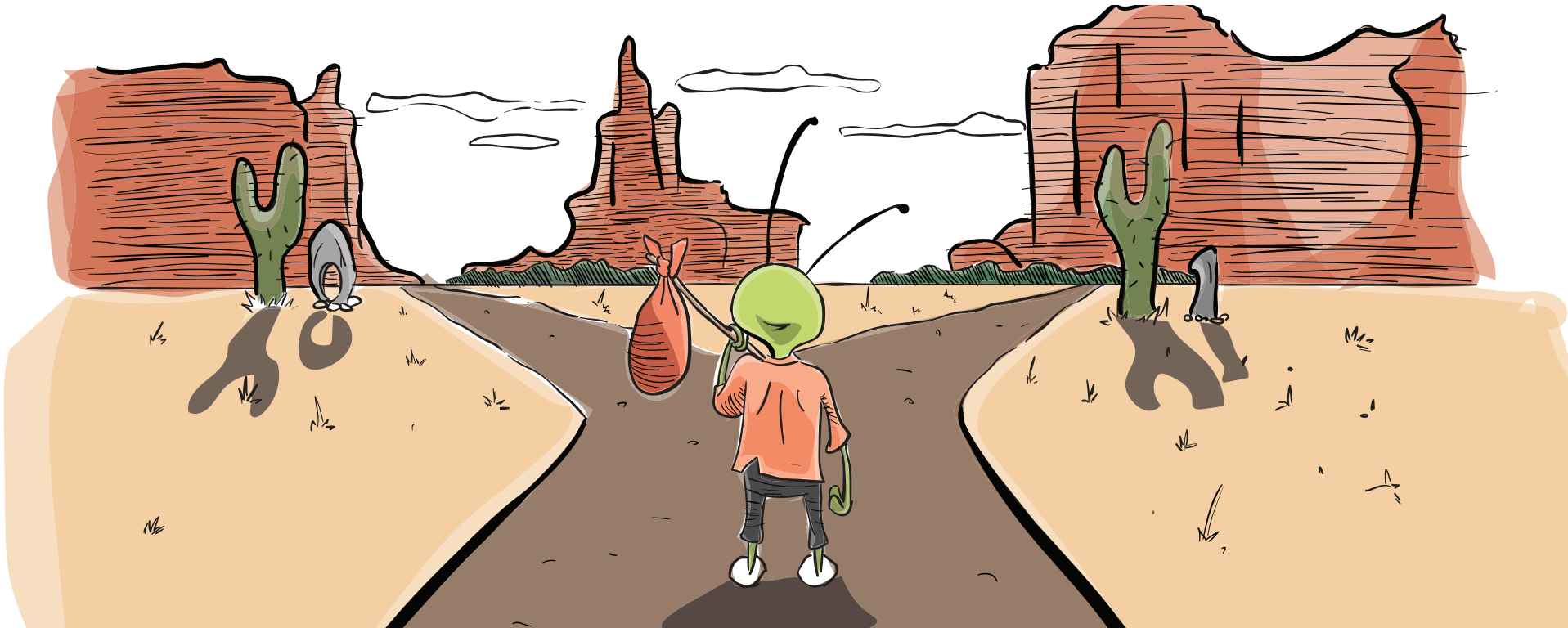
Master Joshway Angrist

MIT 14.381: Fall 2019

Deep Thought

Kwai Chang Caine: What happens in a man's life is already written. A man must move through life as his destiny wills. Old man: Yet each is free to live as he chooses. Though they seem opposite, both are true.

- Kung Fu Pilot



A Contest

At the risk of encouraging your attention to wander,
I offer the following introspective distraction

Econometrics Haiku

- Why Haiku?
  - Haiku is insight, surprise, and humor, briefly expressed
  - Unlike your latest paper!
- As in the Olympics, we'll award bronze, silver, and gold for this event
- Submission deadline: Monday December 9 (sundown)

Examples

- Past winners

  E-con-o-me-tricks!
  Tools we real-ly un-der-stand
  Are most-ly harm-less (H. Ichimura)

  Pol-i-cy e-val
  Diff-in-diff or syn-thet-ic,
  Desk re-ject a-gain!

- A more general professional insight (with thanks to Kei Hirano)

  From negation comes
  growth, progress; not unlike a
  referee report

- Our journey continues

WHAT'S THE EXPERIMENT YOU'D LIKE TO DO?

Econometrics Favors the Brave

- I had *this book* in 3rd grade, now out of print
- I googled last week and *this is what I got*
- We'll have to take our chances ...

Let's Experiment!

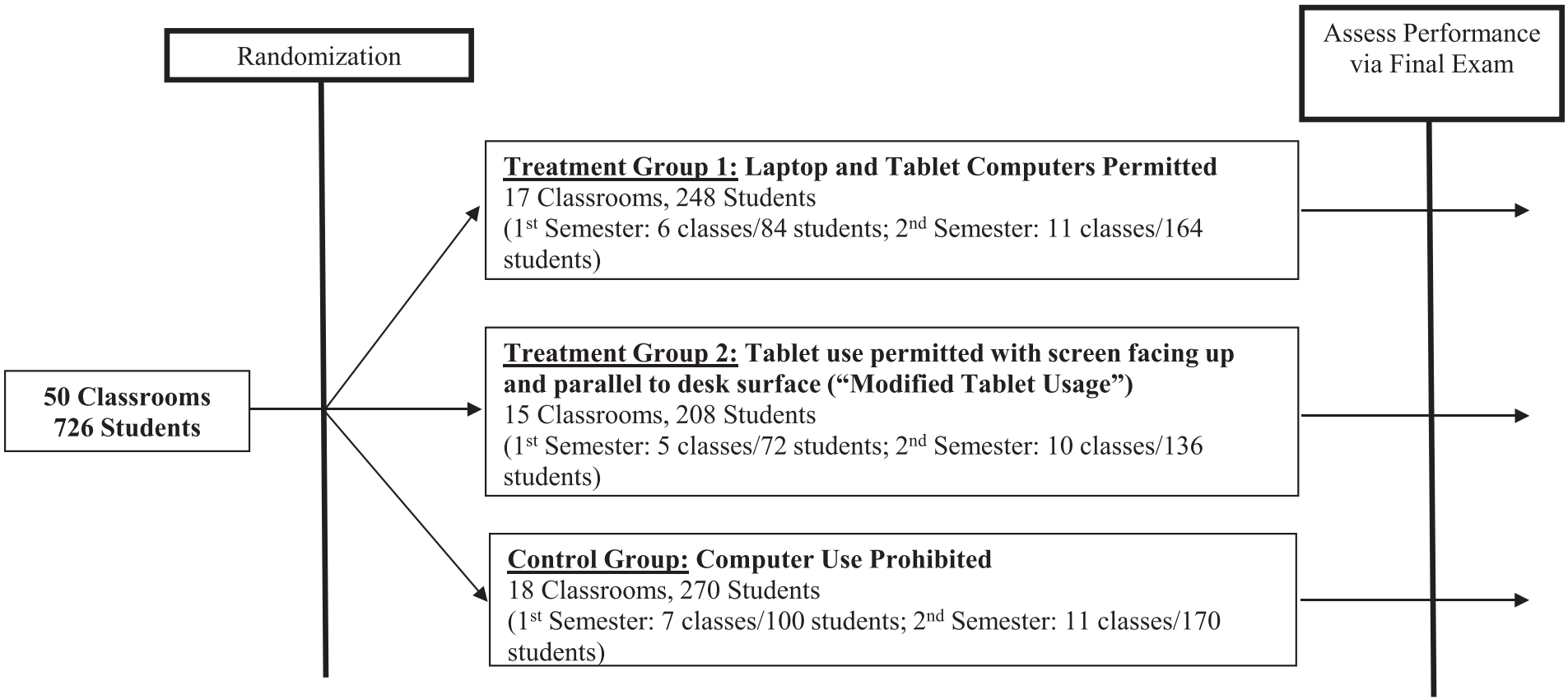


Fig. 1. Experimental design.

Table 2
Summary statistics and covariate balance.

	Control (1)	Treatment 1 (laptops/tablets) (2)	Treatment 2 (tablets, face up) (3)	Both treatments vs. control (4)	Treatment 1 vs. control (5)	Treatment 2 vs. control (6)
A. Baseline characteristics						
Female	0.17	0.20	0.19	0.03	0.06	0.00
				(0.03)	(0.04)	(0.04)
White	0.64	0.67	0.66	0.02	0.02	0.02
				(0.04)	(0.04)	(0.05)
Black	0.11	0.10	0.11	−0.02	−0.02	−0.03
				(0.03)	(0.03)	(0.04)
Hispanic	0.13	0.13	0.09	0.00	0.02	−0.03
				(0.03)	(0.03)	(0.03)
Age	20.12	20.15	20.15	0.03	0.05	0.06
	[1.06]	[1.00]	[0.96]	(0.08)	(0.09)	(0.10)
Prior military service	0.19	0.19	0.16	−0.02	0.00	−0.01
				(0.03)	(0.04)	(0.04)
Division I athlete	0.29	0.40	0.35	0.05	0.07*	0.04
				(0.04)	(0.04)	(0.05)
GPA at baseline	2.87	2.82	2.89	−0.01	−0.05	0.03
	[0.52]	[0.54]	[0.51]	(0.04)	(0.05)	(0.05)
Composite ACT	28.78	28.30	28.30	−0.34	−0.37	−0.54
	[3.21]	[3.46]	[3.27]	(0.26)	(0.31)	(0.33)
P-Val (Joint χ^2 Test)				0.610	0.532	0.361
B. Observed computer (laptop or tablet) use						
any computer use	0.00	0.81	0.39	0.62***	0.79***	0.40***
				(0.02)	(0.03)	(0.04)
Average computer use	0.00	0.57	0.22	0.42***	0.56***	0.24***
				(0.02)	(0.02)	(0.03)
Observations	270	248	208	726	518	478

Notes: Columns 1–3 of this table report mean characteristics of student in the control group (classrooms where laptops and tablets are prohibited), treatment group 1 (laptops and tablets permitted without restriction), and treatment group 2 (tablets are permitted if they are face up). Standard deviations are reported in brackets. Columns 4–6 report coefficient estimates from a regression of the baseline charactersitics on an indicator variable that equals one if a student is assigned to a classroom in the indicated treatment group. The regressions used to construct estimates in columns 4–6 include (instructor) x (semester) fixed effects and (class hour) x (semester) fixed effects. The reported *p*-values in Panel A are from a joint test of the null hypothesis that all coefficients are equal to zero. Observed computer usage, reported in panel B, was recorded during three lessons each semester of the experiment. Any computer use is an indicator variable for ever using a laptop or tablet during one of these three lessons. For example, a student who uses a computer during one of these three lessons has a value of one for any computer use and has an average usage rate of one-third. Robust standard errors are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 3
Laptop and modified-tablet classrooms vs. non-computer classrooms.

	(1)	(2)	(3)	(4)
A. Dependent variable: Final exam multiple choice and short answer score				
Laptop/tablet class	−0.21***	−0.20***	−0.19***	−0.18***
	(0.08)	(0.07)	(0.06)	(0.06)
GPA at start of course			1.13***	1.00***
			(0.06)	(0.06)
Composite ACT				0.06***
				(0.01)
Demographic controls		X	X	X
R^2	0.05	0.24	0.52	0.54
Robust SE *P*-Val	0.010	0.005	0.001	0.002
Wild Bootstrap *P*-Val	0.000	0.000	0.000	0.000
B. Dependent variable: Final exam multiple choice score				
Laptop/tablet class	−0.18**	−0.17**	−0.16***	−0.15**
	(0.08)	(0.07)	(0.06)	(0.06)
Demographic controls		X	X	X
GPA control			X	X
ACT control				X
R^2	0.06	0.24	0.46	0.48
Robust SE *P*-Val	0.027	0.019	0.009	0.016
Wild Bootstrap *P*-Val	0.000	0.000	0.000	0.000
C. Dependent variable: Final exam short answer score				
Laptop/tablet class	−0.22***	−0.22***	−0.21***	−0.19***
	(0.08)	(0.07)	(0.06)	(0.06)
Demographic controls		X	X	X
GPA control			X	X
ACT control				X
R^2	0.06	0.18	0.42	0.43
Robust SE *P*-Val	0.007	0.004	0.001	0.002
Wild Bootstrap *P*-Val	0.006	0.016	0.000	0.008
D. Dependent variable: Final exam essay questions score				
Laptop/tablet class	0.02	0.02	0.03	0.03
	(0.07)	(0.06)	(0.06)	(0.06)
Demographic controls		X	X	X
GPA control			X	X
ACT control				X
R^2	0.33	0.38	0.50	0.51
Robust SE *P*-Val	0.785	0.766	0.642	0.548
Wild Bootstrap *P*-Val	0.757	0.775	0.627	0.509

Table 4
Unrestricted laptop/tablet classrooms vs. non-computer classrooms.

	(1)	(2)	(3)	(4)
A. Dependent variable: Final exam multiple choice and short answer score				
Computer class	−0.28***	−0.23***	−0.19***	−0.18***
	(0.10)	(0.09)	(0.07)	(0.07)
GPA at start of course			1.09***	0.92***
			(0.07)	(0.07)
Composite ACT				0.07***
				(0.01)
Demographic controls		X	X	X
R^2	0.08	0.28	0.54	0.57
Robust SE *P*-Val	0.003	0.007	0.005	0.005
Wild Bootstrap *P*-Val	0.000	0.000	0.000	0.000
B. Dependent variable: Final exam multiple choice score				
Computer class	−0.25***	−0.20**	−0.16**	−0.15**
	(0.10)	(0.009)	(0.07)	(0.07)
Demographic controls		X	X	X
GPA control			X	X
ACT control				X
R^2	0.08	0.27	0.48	0.50
Robust SE *P*-Val	0.009	0.023	0.025	0.029
Wild Bootstrap *P*-Val	0.000	0.000	0.000	0.000
C. Dependent variable: Final exam short answer score				
Computer class	−0.25***	−0.21**	−0.18**	−0.17**
	(0.09)	(0.09)	(0.07)	(0.07)
Demographic controls		X	X	X
GPA control			X	X
ACT control				X
R^2	0.08	0.21	0.44	0.46
Robust SE *P*-Val	0.008	0.016	0.017	0.019
Wild Bootstrap *P*-Val	0.008	0.020	0.022	0.028
D. Dependent variable: Final exam essay questions score				
Computer class	−0.03	−0.01	0.02	0.02
	(0.08)	(0.08)	(0.07)	(0.07)
Demographic controls		X	X	X
GPA control			X	X
ACT control				X
R^2	0.32	0.37	0.50	0.51
Robust SE *P*-Val	0.705	0.912	0.801	0.755
Wild Bootstrap *P*-Val	0.549	0.811	0.721	0.641

What's Next?

- Regression recap; matching de-mystified
- IV, old and new
- RD
- TBD
- Be prepared!