MobLab in ECO100 Tutorials

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If you would like to participate

- goto game.moblab.com
- get username and password from Bob
 PLEASE DO NOT USE YOUR NEIGHBOUR'S USERNAME!
- log in

Push-Pull Game

this game

five rounds, same partner in each round.

Bob's ECO100

Big Picture

- understanding > memorization
- persuaded by evidence on effectiveness of practise (i.e., problem solving)
- not averse to a little paternalism

In Practise

- availability of a ton of non-graded problems with solutions
 - multiple choice; Problem Sets; Previous tests
- weekly Portal quizzes for marks
 - 21 ten-question quizzes (6% of total marks)

"Traditional" tutorials

- heterogeneity in TA quality
 - many are one-and-done Masters students
- solutions-not-provided-to-tutorial-problem-sets norm
 - provides incentives to attend ...
 - TA writes on board for 50 minutes
 - students copy for 50 minutes
- kind of sucks for (most) everyone (including TAs)

MobLab

Games

- A ton of games, although mostly micro
- Best suited for synchronous play
- "Unlimited" number of players per game
- Game instructions for students (videos)
- Results immediately available
- Growing suite of "Modules"

Surveys

- iClicker-like questions
- Free text response

Students participate using any internet-connected device

MobLab in tutorials ECO100 2016–17

- MobLab access required
 - bundled with textbook or \$18 for year
 - requires internet-connected device
- MobLab in every tutorial (19 in total)
 - required participation (3% of ECO100 marks)
 - iClicker-like questions (9 out of 19 tutorials)
 - in-tutorial writing (e.g., reflection questions) (15 out of 19 tutorials)
- games in the majority of micro tutorials (8 out of 19 tutorials)
 - tight link between game and problem solving
 - provides structure ("script") for TAs

"Experiments" = students actively participate

- classroom experiment/demonstration/game/market
- features
 - economic environment approximately matches environment assumed by theory
 - students make choices ⇒ payoffs
 - repeat?
 - results revealed
- classic example Do competitive markets find the price that equates quantities supplied and demanded? (Vernon Smith)

Why experiments?

The evidence on the use of classroom experiments and cooperative learning shows consistent positive effects on student achievement ...

Allgood et al. (JEL 2015)

 strongest effects when participation followed by reflection (Cartwright and Stepanova (2012))

outline for remainder of today

- introduce a couple of games
- outline tutorial plan for each game
- **present initial evidence:** game play $\implies\uparrow$ student outcomes
- review some lessons learned and best practises

Game I: long-run equilibrium in competitive markets

entry/exit ⇒ zero-profit equilibrium really?

Convergence to LR equilibrium: tutorial outline

- video instructions
- instruction comprehension questions
- game 1: equilibrium=9 entrants (out of 12 in each market)
 - review results
- introduce demand shift via MobLab survey questions
 - predict . . .
- game 2: equilibrium=7 (out of 12 in each market)
 - review results
- solve for equilibria (the traditional tutorial exercise ...)

The MobDrive game

- each period, each chooses whether to incur fixed cost to drive for "MobDrive" (think Uber)
- revenue per hour worked determined by number of entrants
- entered? choose how many hours to drive ⇒ profit
- did not enter? can see "would have been" profits

Should I Drive? Depends on how many enter ...



If I chose to enter



Display results

Market 2 Entry Across Rounds



Demand shift!

demand shift introduced by MobLab survey questions

- 1 Uber provides ride-sharing in Toronto. If another service (let's call it lyft) started offering ride-sharing in Toronto, what would happen to the demand curve for Uber?
- 2 Assume another service (let's call it lyft) started offering ride-sharing in Toronto. ASSUMING NO CHANGE IN THE NUMBER OF UBER DRIVERS, what would happen to an Uber driver's revenue per hour driven?
- followed by game with decreased demand

Display results

Market 4 Entry Across Rounds



Game play $\Rightarrow\uparrow$ learning outcomes?

test question

Assume a perfectly competitive market with market demand $MWTP = 30 - \frac{Q}{20}$. Each firm has total cost $TC(q) = 100 + q^2$ and marginal cost MC(q) = 2q.

- 1 In January 2017, the number of firms is fixed at 10. What is each firm's output?
- 2 In January 2018, the market is at is long-run equilibrium. What is each firm's output?

Game play $\Rightarrow\uparrow$ learning outcomes?

raw data

Participated?	Y	Ν
Marks (out of 12)	6.8	4.5
N	504	157

reject null hypothesis (Wilcoxon rank-sum test, p = 0.000)

OLS regression

Marks earned, other questions	0.1659*** (0.000)
Participate MobLab?	0.7395*** (0.009)
Constant	1.675*** (0.000)
Observations	661

Game II: comparative advantage (food trucks)

- opportunity-cost differences (comparative advantage) => Pareto improving trades
- really?

The food-truck game

baseline game

- each morning, each player allocates time between preparing burgers and preparing fries
- payoff=min{burgers, fries} (i.e., you only sell combos)

trade option

- placed into pairs: one with comparative advantage in fries, the other in burgers
- either in pair can propose trade, other accepts or rejects
 - no limit on trade proposals
- after trades, each chooses production

Comparative advantage: tutorial outline

- video instructions
- instruction comprehension questions
- game 1: no trade
 - review results
- introduce trade option
 - TAs and students identify acceptable trades for each type
- game 2: with trade
 - review results
- game 3: with trade and bilateral communication
 - review results
- reflection question: comparative advantage in student's life

Game play $\Rightarrow\uparrow$ learning outcomes?

the test question

	Scarves	Hats
Ajaz	3 per hour	2 per hour
Bob	0.6 per hour	0.8 per hour

In a mutually beneficial trade, ______ sends scarves and receive hats. He only agrees to trades where he gets at least ______ hat for each scarf.

2 ... and vice versa

Game play $\Rightarrow\uparrow$ learning outcomes?

raw data

Participated?	Y	Ν
Marks (out of 5)	3.9	3.2
N	556	154

reject null hypothesis (Wilcoxon rank-sum test, p = 0.000)

OLS regression

Marks earned, other questions	0.0328*** (0.000)
Participate MobLab?	0.278* (0.048)
Constant	1.675*** (0.000)
Observations	710

Games played

- supply and demand (equilibrium convergence)
- comparative advantage
- elasticity and government intervention in competitive markets
- entry, exit and long-run competitive market equilibrium
- prisoners' dilemma (push and pull game)
- voluntary contributions to the public good
- choice under uncertainty
- risk pooling

Looking back

Teaching assistants

- scripting met with initial resistance from more experienced TAs ...
- generally favourable feedback
 - students much more engaged
 - TAs learn new skills (especially relevant for PhD students)
 - "Moblab is such a big step up from traditional tutorials that even the worst game is better than generic problem solving." (*anonymous TA*)

Students

- predominantly (but not universal) enthusiastic response in mid-course survey
- initial evidence of improved learning outcomes

Effective use I

time is a vital input

beginning of year

TA training

before tutorial

- student-facing tutorial documents
- TA-facing tutorial documents
- set up TA playlists
 - while MobLab has a growing suite of modules

in tutorial

- instructions and student comprehension
- game play
- review and discuss results
- post-game reflection

Some lessons learned

- while I have done better with estimating appropriate content for 45 minutes ...
- deterring at-home participation
- need TA game play in TA prep session
- admin burdens

Push-Pull Game Orchestration

Instruction comprehension survey

- Play games
 - 4 one-round games, different partner each game
 - 4 rounds, same partner
 - Indefinite rounds, same partner
- Derive matrix, solve for equilibrium
- Review results
- (Solve non-game matrices)
- Reflection question

First, 4 rounds, each with different partner

100 100 90 90 Percent of Choices 80 Percent of Choices 80 70 70 60 60 50 50 40 40 30 30 20 20 10 10 0 0 Bound 1 Bound 1 Round Round Push/Push Pull/Pull Push/Pull Push/Push Pull/Pull Push/Pull

Push Pull Choices per Round

Push Pull Choices per Round

Then, 4 rounds with same Partner

Push Pull Choices per Round



Finally, chat+indefinite repetition with same partner

Push Pull Choices per Round



Post-Game Reflection Question

apply game results to the student's world

- Assume Prof. Gazzale committed to a grade target regardless of actual exam performance. Explain why Prof. Gazzale is not worried about the collusive opportunity.
- Small-group discussion with answers submitted vial MobLab
- Large groups discussion on what this says about collusion

Initial UofT MobLab Use: In Lecture Hall

the good 400+ concurrent users; positive response the bad time constraints limited game opportunities

MobLab Modules

- Clearly defined learning objectives
- Pre-configured playlists
 - Instruction comprehension questions
 - Pre-configured games
 - Post-game reflection questions
 - Post-results reflection questions

Example II: A disguised Prisoners' Dilemma



Results from mid-year survey

Teaching Assistants

- scripting met with initial resistance from more experienced TAs ...
- universal happiness
 - students much more engaged
 - TAs learn new skills (especially relevant for PhD students)

Students

- predominantly enthusiastic response
- some initial evidence of improved learning outcomes
 - e.g., test question on acceptable trades in Comparative Advantage environment

Thank you.

Comments? Questions? Concerns?

Providing incentives

- "Sincere participation earns full marks"
- Drop *n* lowest weeks
- Small subset of students will earn cash prizes proportional to game play performance
- A vast majority of students will try to maximize points
 - Evidence from experimental economics

Before or After: It depends?

- General rule: avoid experimenter demand
- Before or After:
 - Supply and Demand
 - Market entry
- Definitely Before:
 - Prisoners' dilemma
 - Bertrand competition

When things go wrong ...

- Benefits from participating in environment
- Opportunity for discussion