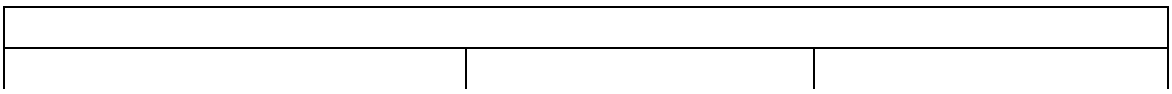

The Journal of Economic Education:

International Handbook on Teaching and Learning Economics

1. Title: Graphing Demand
   How do we plot a demand schedule to make a demand curve on a graph? The math behind the economics: Plotting on a Cartesian plane: http://youtu.be/lW1JkJEs610

2. Title: Interpreting Supply and Demand
   How do we interpret supply and demand graphs? The math behind the economics: reading graphs: http://youtu.be/oHlQ51BquA

3. Title: Shifting Supply and Demand Curves
   What happens when supply and demand curves shift? The math behind the economics: shifting curves: http://youtu.be/vq5qWdsDSRA

   Title: Demand Equations
   How do we find the equation of a straight line demand curve? The math behind the economics: finding the equation of a line: http://youtu.be/0qY4CsHbEsg

5. Title: Finding Equilibrium Algebraically
   How do we find equilibrium? The math behind the economics: solving simultaneous equations: http://youtu.be/GZt_nBknhik

6. Title: Price Elasticity of Demand
   How do we compute price elasticity of demand? The math behind the economics: finding percentage changes: http://youtu.be/GOwuZe_cbv0

7. Title: Average Cost
   How do we compute average total cost? The math behind the economics: finding averages: http://youtu.be/TJXZIsoGxVQ

8. Title: Marginal Cost
   How do we compute marginal cost? The math behind the economics: finding incremental changes): http://youtu.be/9qBS9fD7Vyw

14. Title: The Equation of Exchange
    How do we interpret the relationship between the variables in the equation of exchange? The math behind the economics: solving equations for different variables http://youtu.be/w0dAGaC4dOg

15. Title: Reserve Ratio
    What is a reserve ratio? The math behind the economics: ratios http://youtu.be/vdy9Qr2gsH8

16. Title: Aggregate Supply Curves
    How do we interpret horizontal and vertical aggregate supply curves? The math behind the economics:

Effects of Math Intervention on Learning Principles of Economics

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Why address mathematics weaknesse in principles of economics

- Principles of economics classes often expect that students have mast msf ebssic7Tx9(e)-1

Mathematics for Economics Project:

- Helps students learn the math necessary for learning micro and macro principles
- 16 short videos:
  - explain math used in principles of economics
  - apply the math to economics
- Each video accompanied by 10 questions:
  - students can practice the math
  - students can apply the math to economics

Outline of Presentation

- Literature Review
- Math for Econ Project content
-

Literature Review

- Many studies use math as a control variable in economic education production function studies
- Several studies focus specifically on mathematics and learning economics
- Overall, results are mixed with respect to:
  - different dependent variables
  - effects of different measures of math background

Literature Review (cont'd)

- Cohn et al (1998): no effect of math

Literature Review (cont'd)

- Number and type of math courses taken may not be good proxy for math knowledge and skills.
- Schuhmann et al (2005): develop pre and post test to measure math proficiency.
  - students do not do well on pre-class quiz and thus may not understand math used in the course.
  - quantitative literacy is a significant determinant of economic literacy.

Current study adds to the literature:

- Developed tests to capture pre and post class math and economics knowledge
  - control groups took the tests and did not have access to the videos and self-check assignments.
  - experimental groups took the tests and did have access to the videos and self-check assignments.
- We look at effects of specific systematic intervention addressing math topics necessary for understnd 3.g principles of economics

Math/Econ Project Topics:

1. Graphing Demand (Plotting on a Cartesian plane)
2. Interpreting Supply and Demand (reading graphs)
3. Shifting Supply and Demand Curves (shifting curves)
4. Demand Functions (equation of a straight line)
5. Finding Equilibrium Algebraically (solving simultaneous equations)
6. Price Elasticity of Demand (finding percentage changes)
7. Average Cost (finding averages)
8. Marginal Cost (finding incremental changes)

Math/Econ Project (cont'd)

9. Marginal and Average Cost (relationship between marginals and averages)
10. Profit and Graphs (tangents and area of rectangles)
11. Consumer Surplus (area of a right triangle)
12. Consumption function (mathematical functions)
13. Economic Growth Rates (finding rates of change)
14. Equation of exchange (solving equations for diff 5P6bo veariles)

Research Design and Methodology

- Controlled experiment:
  - Fall 2014: one micro and one macro principles class asked to take pre and post test and questionnaires. Had no access to math/econ projects.
  - Spring 2015: one micro and one macro principles clas asked to take pre and post test and questionnaires. Given extra credit for watching videos and responding to self-check questions.
- Classes taught by same instructors and met same time of day.

Research Design and Methodology
Data collection instruments:

- Background questions: age, sex, year in college, race/ethnicity, language, major, expected grade, self

Videos and Self-Check Questions

- Video and self-check environment for students and instructors
  - Course materials pushed to course shell by AT sta
  -

Videos and Self-Check Questions

- Standard elements in each set of videos
  - Introduce economics question
  - Present the “math behind the economics”
  - Revisit original economics question
  - Give examples of other areas of economics where the same mathematics is used

Videos and Self-Check Questions

- Link to Google Site or Bb shell to view assessments as the student would

Making materials available to all

- Link togooglesite
  - Tools for creating self-check questions with feedback not easy to use

A mathematicians point of view

- Math class vs econ class
  - Should math classes incorporate specific economics applications or leave that to the experts?
  - Should econ classes spend time teaching mathematics?
  - Is there language, notation, conventions that mathematics classes should use differently/more carefully?
  - How can we help students “translate”?

Preliminary Results

Macro students in the experimental group may have*scored higher on the posttest.

(Micro students in experimental group: no difference)

Students in the experimental group may have had somewhat higher post-course opinions about the usefulness of videos.

		Microeconomics		Macroeconomics	
		Control	Treatment	Control	Treatment
Pretest responses (1=not at all useful, 5=extremely useful)					
Videos	Mean	3.60	3.65	3.76	4.04
	St dev	1.06	0.95	1.15	0.98
Internet	Mean	3.73	3.60	3.59	3.96
	St dev	1.16	1.01		

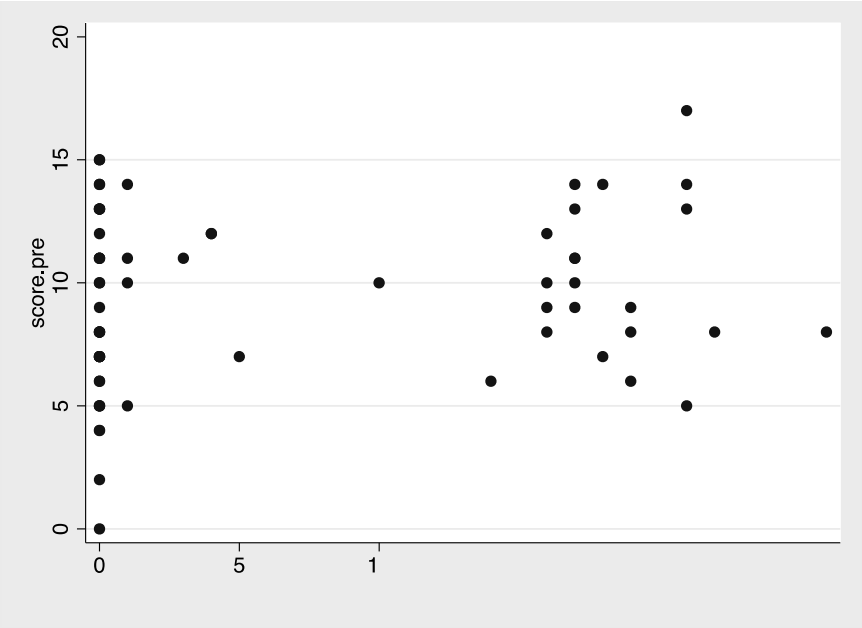
Students showed no clear trends in their post-course excitement or anxiety regarding economics or mathematics

		Microeconomics		Macroeconomics	
		Control	Treatment	Control	Treatment
Pretest responses (1=strongly disagree, 5=strongly agree)					
Econ: excited	Mean	3.9	3.9	3.5	3.7
Econ: anxious	Mean	2.9	3.0	3.3	2.8
Math: enjoy	Mean	4.1	3.4	3.1	2.9
Math: anxious	Mean	2.5	2.8	3.1	2.9
Math: easily apply	Mean	3.8	3.2	3.4	3.3
Mean					

Pre- and post-test scores (of 20) as a function of average self-

Pre- and post-test scores (of 20) as a function of # of self-checks performed

Pre-test scores



Post-test scores

Change in score (post minus pre).

…as a function of average self-check

Further topics to investigate

- Test performance (pre-test, post-test, self-check tests) as a function of the number of times students watched the videos
- Pre- to post-test improvements in:
  - the math portion (10 questions)
  - the economics portion (10 questions)
- With larger sample, could perform regressions controlling for:
  - pre-
    controos

Questions?