



Peer Instruction with Student Response Pads

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Michael Salemi
UNC- Chapel Hill



Peer Instruction with Clickers

1. Introduction
 - What are clickers?
 - Why use clickers?
2. Three Clicker Techniques that Promote Student Engagement
 - Auctions
 - Are-you-with-me Questions
 - Peer Instruction
3. Examples of Peer Instruction



What's New In This Talk?

“Clickenomics: Using a Classroom Response System To Increase Student Engagement in a Large-Enrollment Principles of Economics Course,”

Journal of Economic Education, 40(4), Fall 2009

The Focus of today's talk is peer instruction about which the paper says little.



What are clickers?

- Clickers are radio senders that allow students to respond to instructor prompts.
- On display is the Classroom Performance System (CPS) of *elInstruction*.
- Student responses can be anonymous or linked to students in a grade book.
- Response histograms are quickly available.
- McGraw-Hill partners with *elInstruction* in supporting CPS.

Why Use Clickers?

I believe that the Principles Course should:

Provide student with working knowledge of basic economic concepts.

Replace technical material with interactive learning.

Hansen, Salemi and Siegfried, "Use It or Lose It..."

Using clickers lets me add hands-on activities to lectures.

Using clickers lets me provide incentives for attendance and attention.

How Use Clickers?

1. Surveys

2. Voting

3. Auctions

4. Are-you-with-me Questions.

5. Peer Instruction



Turn on Your Clickers.

My clicker is turned on.

If "Yes", Send "A".

If "No", Send "B".



We will warm up with an auction.

Auctions

Auctions are a great strategy for introducing:

Reservation Prices

Consumer Surplus

Demand Schedules

CPS allows quick and efficient bid collection.

The auction in my principles class led to spirited discussion.

Clicker Auction

- ➔ On Offer: A UNC National Champs T Shirt
- ➔ Use clickers to bid.
- ➔ All bids are binding...this is for real.
- ➔ The winner is the highest bidder. In case of ties, the high bidders will draw lots.
- ➔ The winner will pay the second highest bid.
- ➔ Bid your reservation price.

Clicker Auction

Bid with your Clicker.

Bid in multiples of 10 cents.

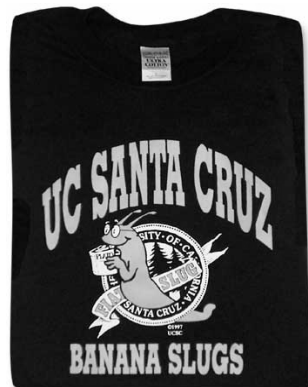
To Bid \$5.10:

Key In "5 - Sym -1 - 0 - Send".

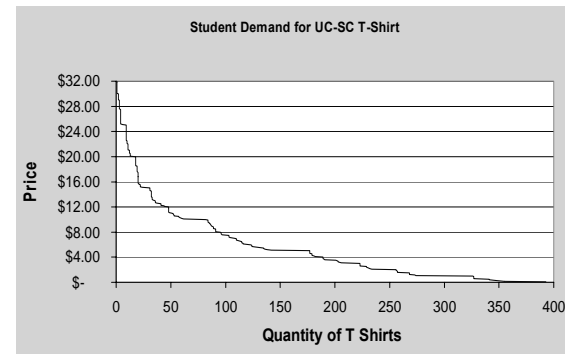
To Bid \$40.60:

Key In "4 - 0 - Sym - 6 - 0 - Send".

My Auction in Econ 101



Demand Schedule Derived from Student Bids for UCSC T-Shirt





Are-You-With-Me Questions

- ➡ I use this application most often.
- ➡ The typical question is multiple choice.
- ➡ I base 10% of the grade on CPS questions .
- ➡ I count only the top 90% of student responses.



Are-you-with-me Example

**Use Your Clicker To Answer
The Following Question.**



Are-you-with-me Example

Raleigh politicians have proposed a new convention center. They suggest paying for it by raising the hotel tax. They argue that the project will be free to voters since out-of-town visitors will pay for it.



Are-You-With-Me Example

Which of the following best explains why the Convention Center is not free for Raleigh citizens?

- A. The hotel tax increase will cause a reduction in visits to Raleigh.**
- B. Cost overruns are common with public projects.**
- C. The marginal benefit of the project exceeds the marginal cost.**
- D. The hotel tax funds could be used for other projects.**

Peer Instruction

1. Instructors break their lectures into parts--each part focusing on one concept.
2. At the end of each mini-lecture, the instructor gives a concept quiz.
3. Students answer without consultation.
4. The instructor views but does not display the histogram of responses.

Peer Instruction

5. The last step depends on the fraction of students who answer correctly.

If correct < 30%, re-teach the concept.

If correct > 85%, go on to next concept.

If 30% < correct < 85%, begin peer instruction.

Peer Instruction

Tell students how well they did on first polling but do not show the histogram.

Tell students to form a group with their neighbors.

Tell students to discuss the question.

Tell students to strive for consensus.

Re-ask the question.

Peer Instruction

The frequency of correct responses typically increases between the first and second polling.

Physics educators report that student learning (as measured by final exam scores) increases when peer instruction is used.

Peer Instruction Example 1

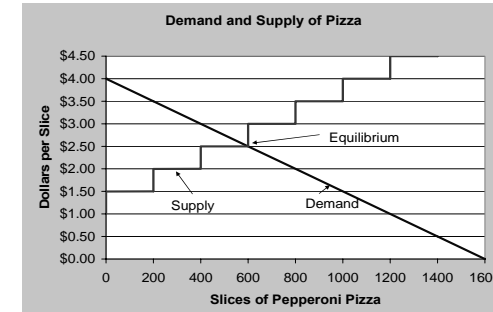
If the price of chicken feed falls, the equilibrium price of chicken will ____ and the equilibrium price of beef will ____.

Response	First Poll	Second Poll
A. Fall, Fall	57	79
B. Fall, Rise	31	20
C. Rise, Fall	9	1
D. Rise, Rise	3	1

Peer Instruction Example 2

In equilibrium, the number of slices that will be denied to consumers even though consumers have a positive reservation price for those slices is ...

- A. 0
- B. 600
- C. 1000
- D. 1600



Peer Instruction Example 2

In equilibrium, the number of slices that will be denied to consumers even though consumers have a positive reservation price for those slices is ...

Response	First Poll	Second Poll
A. 0	36	41
B. 600	15	10
C. 1000	47	48
D. 1600	2	1

Peer Instruction Example 3

Harry's Output As A Can Recycler

Search time (hours/day)	Total number of containers found	Additional number of containers found
0	0	600
1	600	400
2	1,000	300
3	1,300	200
4	1,500	100
5	1,600	

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Peer Instruction Example 3

If Harry can wash dishes for \$6.00 per hour or earn \$0.02 per recycled can, how many hours should Harry devote to recycling?

Response	First Poll	Second Poll
A. One hour	9	1
B. Two hours	15	24
C. Three hours	63	93
D. Four hours	13	3

Peer Instruction Example 3

Why Harry should commit up to 3 hours to recycling and the rest to dishwashing.

The marginal (opportunity) cost of Harry's time as a recycler is \$6.00 per hour.

The marginal benefit of can recycling is:

- \$12.00 (600 x .02) for hour one.
- \$ 8.00 (400 x .02) for hour two.
- \$ 6.00 (300 x .02) for hour three.
- \$ 4.00 (200 x .02) for hour four.

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Peer Instruction Example 3

Harry's Supply of Can-Recycling Services

What price for recycled cans would lead Harry to commit additional hours to recycling?

Hours	MC	MB	Harry's Reservation Price (RP)
1	\$6	600xRP	\$0.01
2	\$6	400xRP	\$0.015
3	\$6	300xRP	\$0.02
4	\$6	200xRP	\$0.03
5	\$6	100xRP	\$0.06

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Peer Instruction Example 4

John Jones owns and manages a café in Chapel Hill. His weekly costs and revenues are given in the table.

Item	
Revenue	\$5,000.
Labor	\$2,000.
Food and Drink	\$1,500.
Electricity	\$ 100.
Vehicle Lease	\$ 150.
Rent	\$ 500.
Interest on Equipment Loan	\$ 50.

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Peer Instruction Example 4

John uses a gift to pay off his equipment loan. The interest rate he pays on the loan is the same as the rate he can earn on his saving. John's accounting profit _____ and his economic profit ____.

Response	1st Poll	2nd Poll
A. Rises, Stays the same	50	74
B. Rises, Rises	29	19
C. Stays the Same, Rises	15	5
D. Stays the same, Stays the same	6	2

Peer Instruction Example 5

At each family gathering, your grandfather is fond of pointing out that when he was a boy a loaf a bread cost only \$0.10.

He decries the fact that the price of bread today is \$2.50 and concludes that somehow "times are bad."

Which of the following best explains why your grandfather is wrong?

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Peer Instruction Example 5

Responses	1st Poll	2nd Poll
A. The higher price of bread today is due to the higher quality of bread today.	1	0
B. Today, the US consumes a larger fraction of GDP than it did when your grandfather was a boy.	10	14
C. Inflation makes it impossible to compare today's bread price with the price 50 years ago.	53	12
D. Today, the ratio of the price of bread to the hourly wage is smaller than it was 50 years ago.	36	74

Peer Instruction Demonstration

The Fundamental Value of an asset is the present value of its stream of expected future payments.

One can compute fundamental value with reverse induction.

What is the present value of a zero-coupon bond that matures in ten years if the annual interest rate is constant at R?

Year	Fundamental Value
9	$FV(9) = \$1000/(1+R)$
8	$FV(8) = FV(9)/(1+R) = \$1000/(1+R)^2$
0	$FV(0) = FV(1)/(1+R) = \$1000/(1+R)^{10}$

Peer Instruction Demonstration

Consider an artificial asset.

1. Each period the asset pays a dividend of \$1.00.
2. After it pays the dividend it “dies” with a probability of 1/6 and pays no more.
3. If it survives to the end of the game, the asset makes a final payment of \$6.00.

The fundamental value of the asset is FV. FV is:

- A. $\$4.50 < FV < \5.50 B. $\$5.50 < FV < \6.50
C. $\$6.50 < FV < \7.50 D. $FV \geq \$7.50$

What is your view?

As an instructional technique for a large enrollment lecture course, the expected benefits of Peer Instruction are greater than the expected costs.

- A. Strongly Agree
B. Agree
C. Neither Agree nor Disagree
D. Disagree
E. Strongly Disagree

Questions about CPS?

Please contact:

Greg Kilkenny, VP of Sales
Greg.kilkenny@einstruction.com
(678) 947-8377



Thank You

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