

# Using Clickers to Engage Students and Enhance Learning

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- Glenn Caffery; colleague and IT Chair
- Bernie Morzuch; colleague
- Davis Educational Foundation

## **Davis Educational Foundation Grant: *Creating Active Learning Through Technology (2004–06)***

- **Six Departments, 16 faculty, 10 courses, 20 sections**
- **Large Intro Classes; 150 to 475 students**
  - Classics, Chemistry, Economics, English, Music & Dance, Resource Economics [Stats]
- **Redesign lectures to include technology**
  - In-class with PRS
  - Out of class with OWL and WebCT
- **Four Semesters; S04 to F05**

## **Overall at UMass Amherst**

With the help of Davis Educational Foundation Grants, over the last 5 years, we've gone from a handful to:

**40 Instructors using PRS**

**Over 10,000 student seats per year.**

**UMass has 900 instructors and 18,000 undergrads**

## Davis Grant Data Collection

- Over 11,000 students in four semesters
- Early and late surveys
- Student data (SAT, high school GPA, UMass GPA, gender, major...)
- Semester Course Grades
- Faculty Surveys and Interviews

## What's the Problem?

- Lower Funding and Larger Courses
- Students feel disconnected
  - From teacher
  - From material
- Attendance
- Attention
- Students never reach higher levels of learning
- Abundant technology but not harnessed

## Passive Attendance

- Students can't answer questions in a large class
- Shy students lose out
- Visiting; Reading; Sleeping
- Walking in late or out early

## What is PRS?

- Personal Response System
  - Wireless transmitter – like a TV remote
  - Student brings transmitter – answers questions posed by the professor
  - Computer records student answers
  - Textbook Store sells/buys *clickers*.
- See: <http://www.umass.edu/prs>

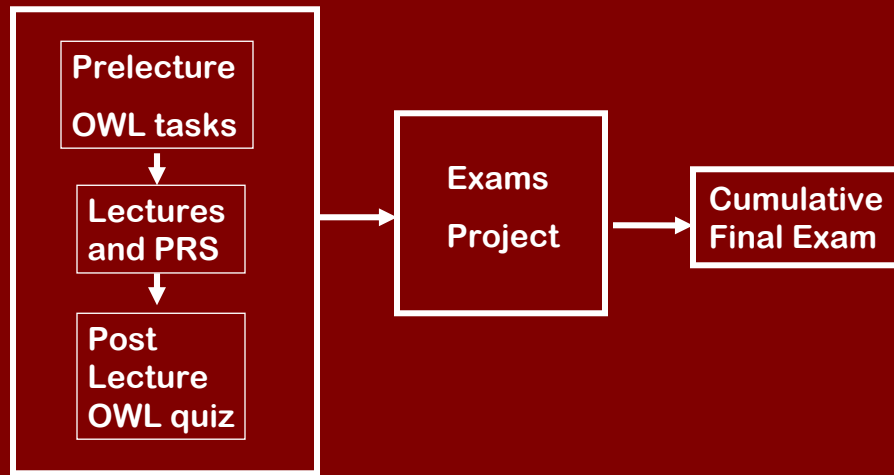
## Why Use PRS?

- Promote active learning
- Improve communication
- Questions are effective teaching tool
- Students must keep up
- We all need carrots and sticks

## Central Premise

- Before asking “is the student engaged?”
- Ask “is the instructor engaged?”
- Everything you do, from your syllabus to your PRS questions reflects how much you care about your students’ learning
  - Hint: Don’t just use publisher’s questions
  - A bad lecture is still a bad lecture with PRS
    - But now students can vote to tell you so

## From Teaching Tools to Learning



## Two Teaching Models

1. Ask little of your students and they will ask little of you
2. Ask a lot of your students and they will ask a lot of you

PRS and OWL will increase your costs of preparing materials and administration

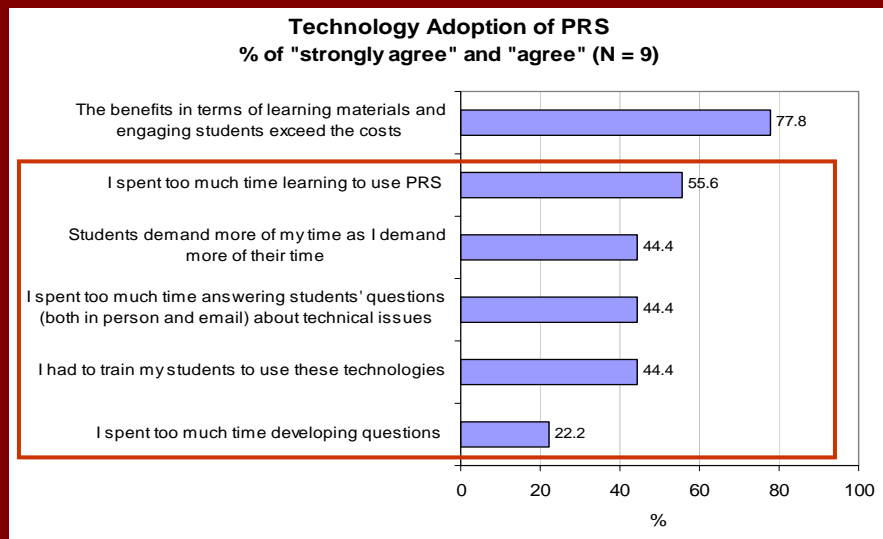
How do we provide incentives to offset the costs?

## Our View of PRS

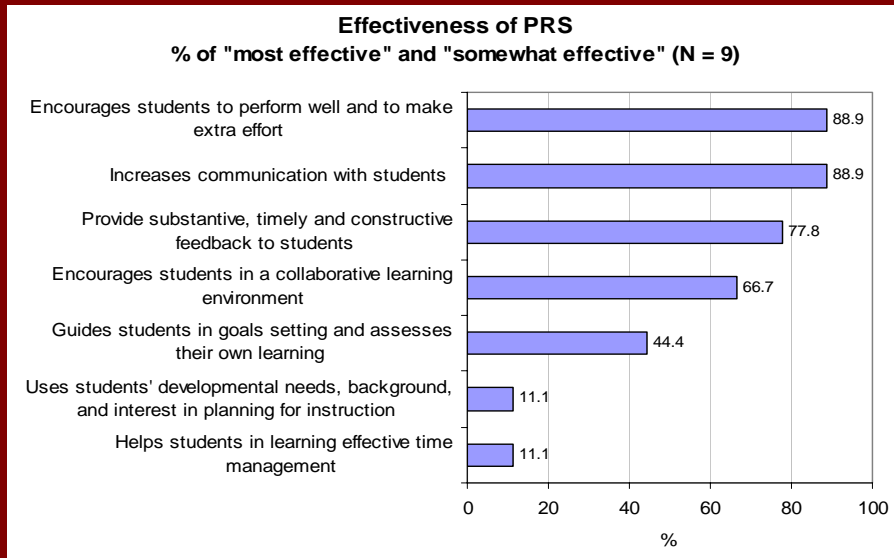
- It is NOT an attendance tracking tool
- But a tool to improve attendance
- Another incentive to “go to class”
- By improving lectures
  - ✓ Attention spans
  - ✓ Engagement
    - Get involved
    - Buy-in to class activity
  - ✓ Universal participation
  - ✓ Immediate Feedback

## Teaching Technology Adoption

Think about a similar course you have taught that doesn't use PRS.  
Compared to that course:



## Faculty's view of the effectiveness of PRS in enabling the following teaching practices:



## Student's View of PRS

- It is an attendance tracking tool
- Another incentive to "go to class"
- We asked:
  - ✓ What motivates you to go to class?
- They said:
  - ✓ Class attendance helps me keep up; 70%
  - ✓ Class attendance recorded and counts; 71%

## Does Attendance Matter?

Classes Missed	Number of students	# who did not take Final	Mean on Final Exam
<b>Many</b>	74	8	50.6
<b>Some</b>	116	1	58.8
<b>One/None</b>	103	0	63.4
Source: Intro Stats F05 Res Ec 212 Rogers	293	9	

## Show Video here

- PRS in the student's voice

## Using PRS in Lecture

- Good questions are paramount
- Critical Role of Teacher
- Is this question accomplishing a goal?
  - ✓ Introduce a Concept
  - ✓ Create and build on Curiosity
  - ✓ Generate Discussion; Opinions Vary
  - ✓ Assess Performance
  - ✓ Gather data for use or interest
  - ✓ Reward all with “we can do this” now

## Student's Evaluation of PRS

Over the last 7 years,

- ✓ 80% call PRS a success
- ✓ 20% call it a failure.

What they like:

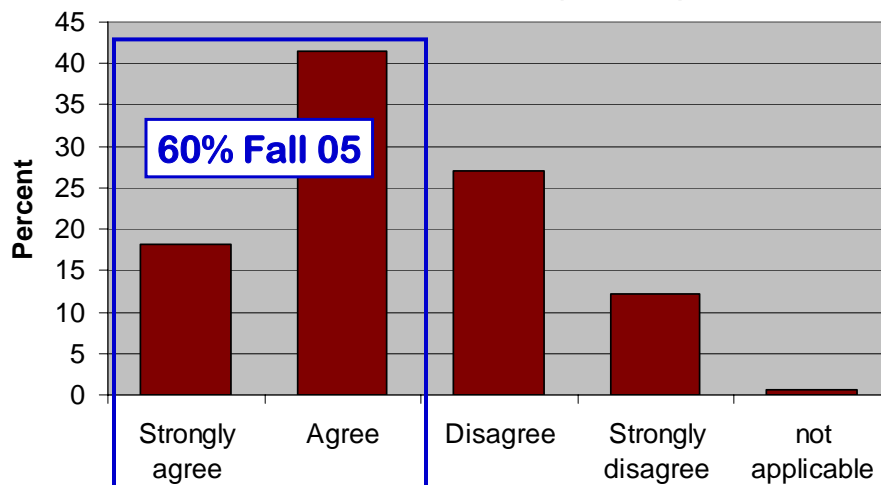
- ✓ Instant feedback
- ✓ Break up lecture
- ✓ Participate in lecture

## Results from our Davis Educational Foundation Grant

- Featuring Fall 2004/05 Courses
  - ✓ Two stats courses;
    - One for Life Sciences
    - One for Business
  - ✓ One English course
  - ✓ Intro General Chemistry courses
  - ✓ Intro Macroeconomics course

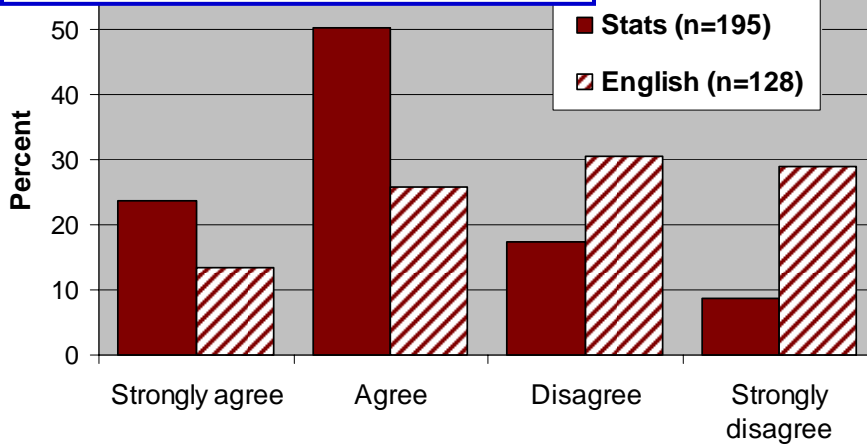
*"I was better prepared for class because I would need to answer PRS questions."*

*All 5 PRS Davis Courses (n = 1099)*

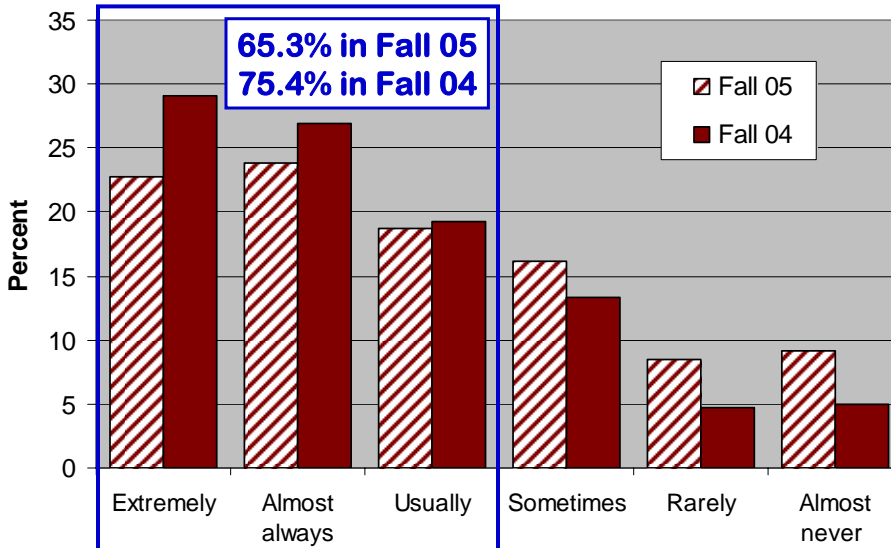


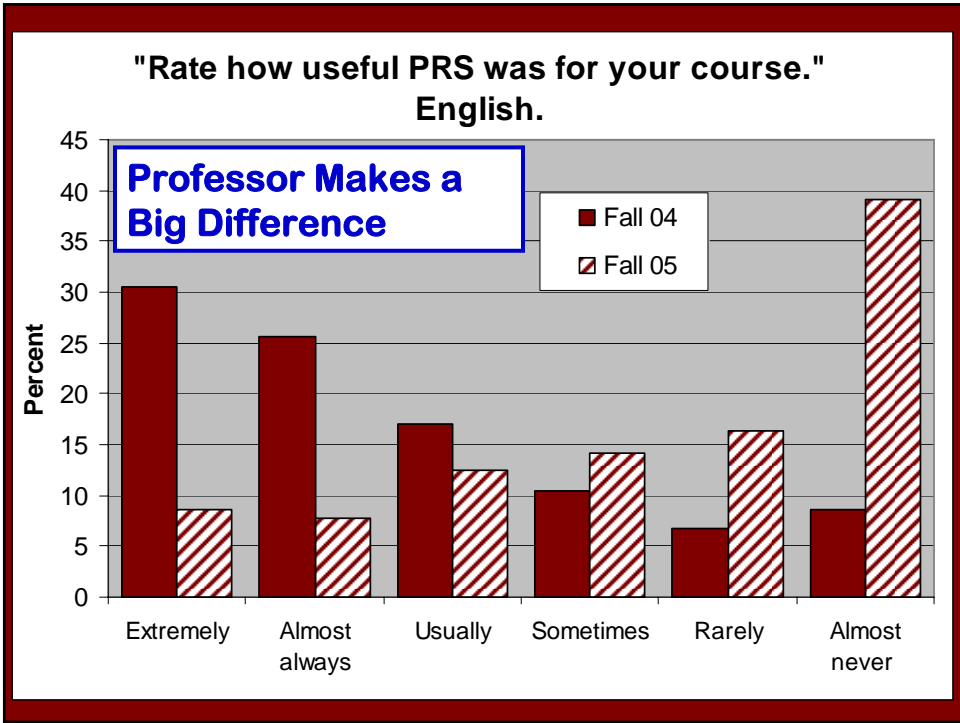
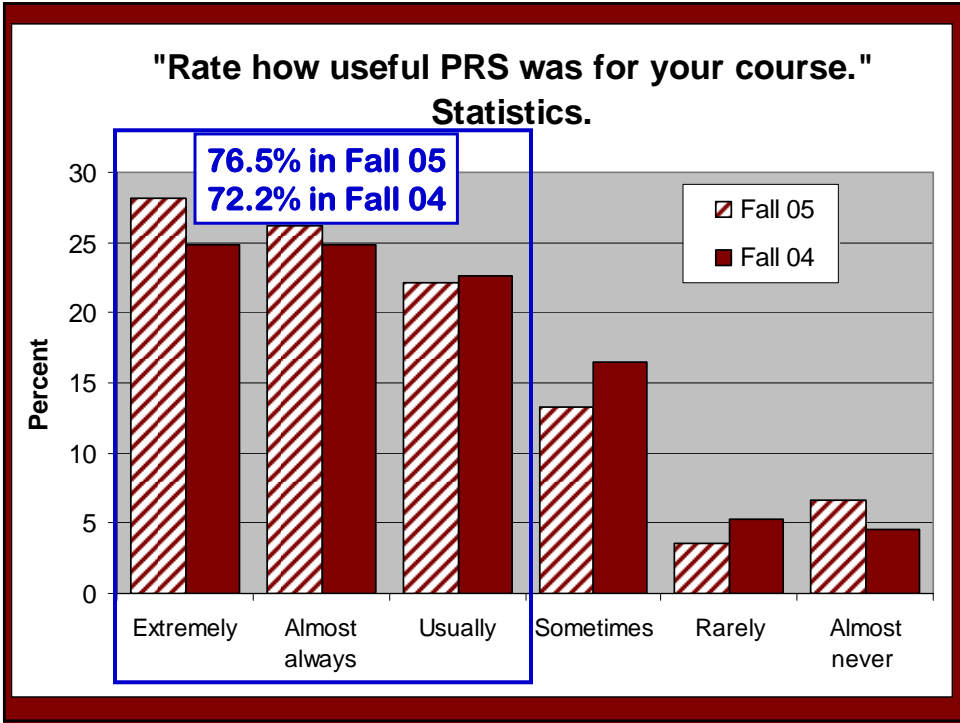
*"I was better prepared for class because I would need to answer PRS questions."*

**Professor Makes a Difference**



**"Rate how useful PRS was for your course."  
All 5 Davis Courses.**





## How Useful was PRS in helping you learn in this class?

Gender	Very Useful	Useful	Not Useful	Total
Female	56%	34%	10%	473/46%
Male	58%	32%	10%	566/54%
Total	595 57%	344 33%	100 10%	N=1039

Fall 2004 courses: English, Macroeconomics, Organic Chemistry, and Statistics.

## Next Steps

1. Link *some* PRS in-class activities to OWL out-of-class assignments.
2. Students have *personalized* data/answers.
3. Students share know-how, not answers.
4. Goal remains: "Students should go to class and do their homework."

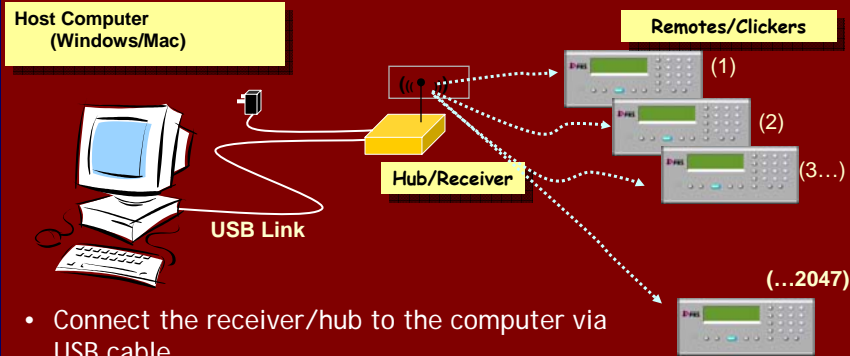
## Personalized Lectures – PPRS

- OWL Pre-Lecture linked to PRS.
- Students complete OWL exercise, bring data to class to use for PRS questions.
- Eliminates one annoying feature of PRS: "What's the answer?"
- But do lose instant feedback
- Goal: Class of 200 with 75+ TAs. **The students!**

## Benefits of PPRS

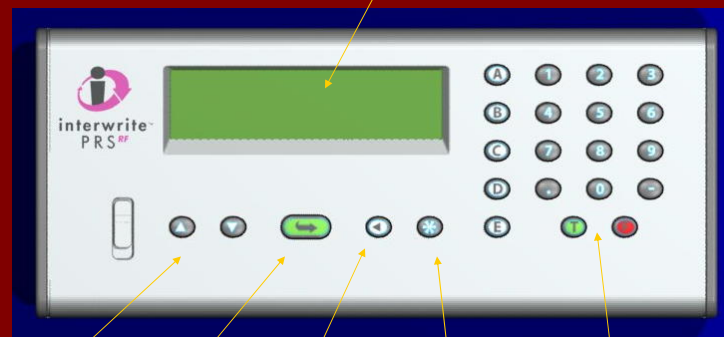
- ✓ Increases student interaction.
- ✓ Students ask: "How do we do this?"
- ✓ Students are more engaged in class.
- ✓ Students more invested in lectures.

# System Architecture (Set Up)



- Connect the receiver/hub to the computer via USB cable.
- Up to 4 receivers can be attached currently for a system capacity of 8,000 remotes.
- Computer sets up Hub to broadcast proper class information (Class ID, Class String, Test Type)

# PRS RF Student Clicker



*Two line display for indicating response and status of receipt*

*Scroll Keys    Send/Enter    Backspace    Alpha, Numeric and T/F Keys*

AAA batteries used to keep future costs down.

Setup Key  
Diagnostics include Battery level %

## Sign on Process (Today) Joining a Class

- Turn on Clicker
  - Battery symbol displayed
- Unit will scan and find “PRS101”
- Hit “Send/Enter” key (green)
- Your clicker will go to sleep soon
- That’s good, wake it up by hitting any key
- Enter answer, then
- Hit “Send/Enter” key (green)

## Question Types Supported

- Multiple Choice Alpha (Single or Multiple Correct)
- Multiple Choice Numeric (Single or Multiple Correct)
- Answer Series Alpha
- Answer Series Numeric
- Numeric (up to 11 characters + “-” sign)
- Short Answer (up to 11 characters + “-” sign)
- True/False

**I have used PRS or a similar system.**

Please respond using the **True** or **False** buttons on your clicker.



**Before we invest in new technology, we need to invest in more teacher support.**

Please enter the letter closest to your view:

**A - Strongly agree**

**B – Agree**

**C – Neutral**

**D – Disagree**

**E - Strongly disagree**



**How large is the largest course you  
have taught (or have taken if you  
are not teaching)?**

**Enter any real number,  
then submit**



**At what class size do you start  
cutting back on the activities you  
require the students to do because it  
takes too much time to grade and  
provide feedback?**

**Enter any real number,  
then submit**



**How many courses do you teach per year?**

**Enter any real number,  
then submit**



**The population mean is 6.5 courses,  
with a standard deviation of 2.3  
courses.**

**Now what is Your Personal Z-score?**  
enter any real number including the sign,  
rounded to two decimal places, then submit

**Just kidding, but this is an example of a  
Personalized PRS question where answers  
will differ and depend on previous data!**

## What is PRS? Tell us your opinion... Choose all that apply.

1. A tool to enhance learning.
2. A tool for taking attendance.
3. A fun way to take a break from pure lecture.
4. A tool to engage students.
5. An expensive gadget.
6. A punitive tool.
7. Other.



## Administration Challenges

- Hardware: PC or Mac; Whose Clickers?
- RF or IR; student or school owned?
- Software and Data management:
  - ✓ Clicker registration
  - ✓ Grading
  - ✓ Showing results to students
  - ✓ Student complaints:
    - forgot clicker, battery failed, didn't get in on Q3, have new clicker today, ...
  - ✓ Merging data to gradebook
- Support – pedagogy and technology.

## Overall Assessment

- **No magic methods, different tools appeal to and affect different learners**
- **PRS can improve a course with:**
  - ✓ **Increased active learning**
  - ✓ **More engaged, interested students**
  - ✓ **Improved Learning, better retention**

## Overall Assessment

- **But:**
  - ✓ **Requires effort and skill**
  - ✓ **It can be misused**
  - ✓ **Not all students welcome it**
- **And ...**
  - ✓ **Talented Teachers still Required**
  - ✓ **And students still need to do their homework and go to class**

**Thanks.  
Questions, Comments?**

**Contact:**

**rogers@provost.umass.edu**

**[www.umass.edu/prs](http://www.umass.edu/prs)**

**How did we do?  
Session Evaluation**

**Please enter the letter closest to your view:**

- A – Excellent**
- B – Good**
- C – OK**
- D – not so good**
- E – Terrible**

