

Engaging Students and Promoting Discussion by Using Clickers in Large Science Lectures

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Teaching with Technology

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Clicker adopted by UMCP



Radiofrequency transmitter with range of 200 feet



Receiver plugs into USB port of PC and can receive up to 1000 student responses.

www.turningtechnologies.com

Our Courses

Organic Chemistry II

- 473 students in 2 lectures
- Primarily sophomores
- Majors:
 - 62 % biol. sciences
 - 10 % chem / biochem
 - 7 % engineering
 - 5 % AGNR
 - 16 % other
- Traditional lecture format

General Microbiology

- 250 students/lecture
- Primarily sophomores
- Majors Spring 2006
 - 37.5% Biol Sciences
 - 12% Dietetics, PreNurs/PrePharm
 - 7.5% LTSC
 - 7.5% Animal Science
 - 6% Biol Res Engineering
 - 5% BCHM
 - 25% other
- Mixed mode course

Motivation to Incorporate Clickers

- Further engage students in lecture
- Mechanism for in-class assessment
- Stimulate discussion in class
- Provide mental breaks
- Reduce anonymity in large class
- Reward student participation

Types of Questions

Multiple Choice format

- Review from last class
- Take a pulse
- Predict what comes next
- Explain why
- Sample exam questions
- Polling

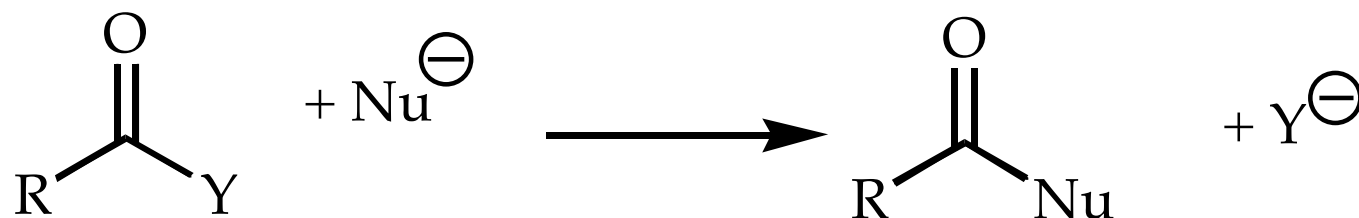
How we use the clickers

- Create questions that promote discussion
- Encourage discussion with neighbors before answering
- Use common misconceptions as answer choices
- Award points for participation, regardless of answer

Turning Technologies Software

- Adds a toolbar to normal PowerPoint window
- Allows import of student roster from WebCT
- Can easily transform a regular PowerPoint slide to a clicker-ready slide
- Student responses are exported as Excel files

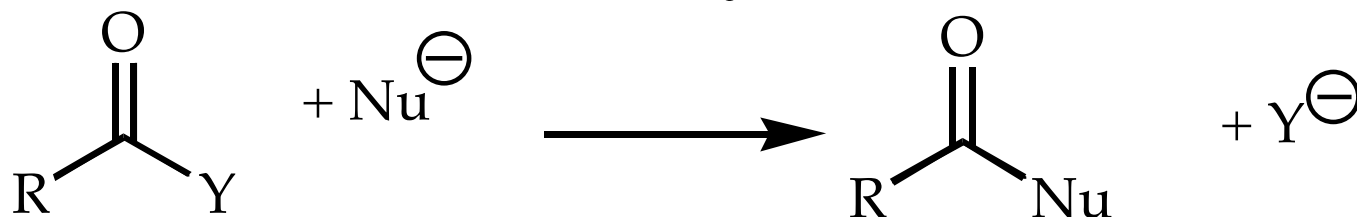
In a nucleophilic acyl substitution reaction, Y can generally NOT be H or an alkyl group. Why?



1. H^- and R^- are poor nucleophiles.
2. H^- and R^- are poor leaving groups.
3. H^- and R^- are too electronegative.
4. H^- and R^- are too basic.

In a nucleophilic acyl substitution reaction, Y can generally NOT be H or an alkyl group.

Why?



11% 1. H⁻ and R⁻ are poor nucleophiles.

84% 2. H⁻ and R⁻ are poor leaving groups.

1% 3. H⁻ and R⁻ are too electronegative.

3% 4. H⁻ and R⁻ are too basic.

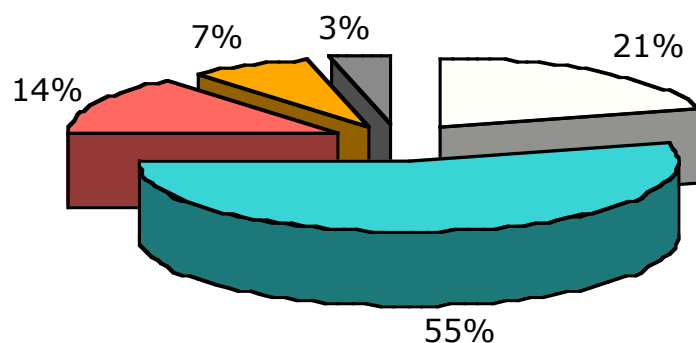
Student Participation Rates

Organic II

- ✓ Average Participation = 91%
- ✓ 84% on Friday before Spring Break!

What do students think?

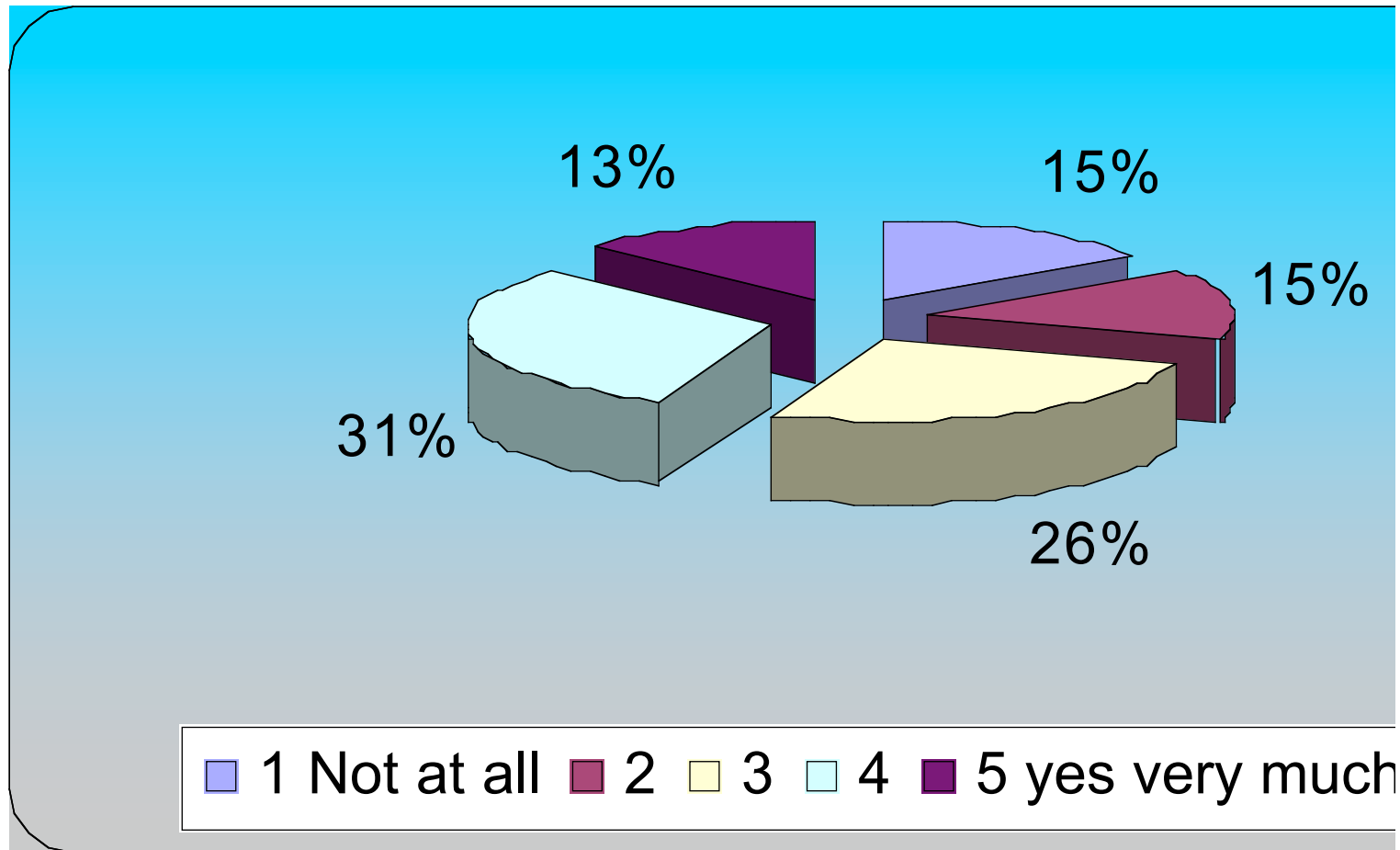
I have increased my understanding of organic chemistry by participating in the clicker questions during lecture



- Strongly agree
- Somewhat agree
- Undecided
- Somewhat disagree
- Strongly disagree

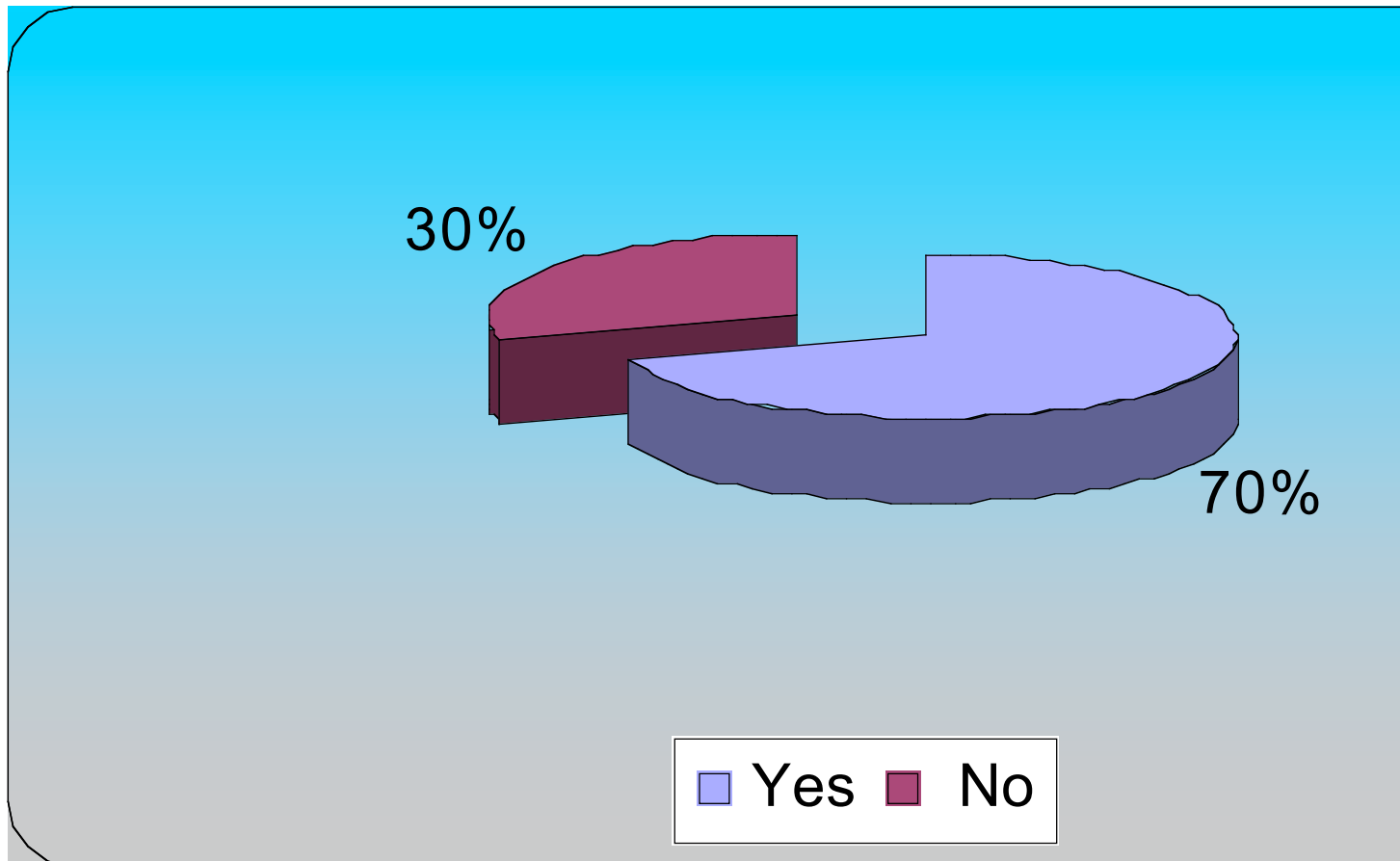
Organic Chemistry Spring 2006

Using Clickers helps me feel more engaged in lecture



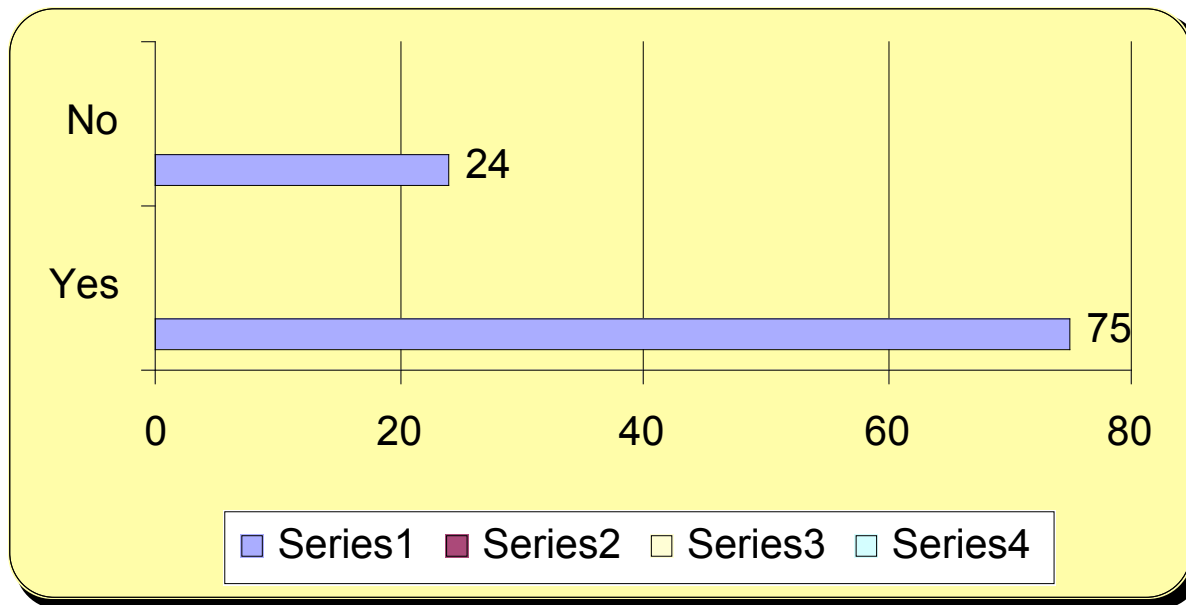
General Microbiology F 2005

I think that clickers are a good idea for large classes.



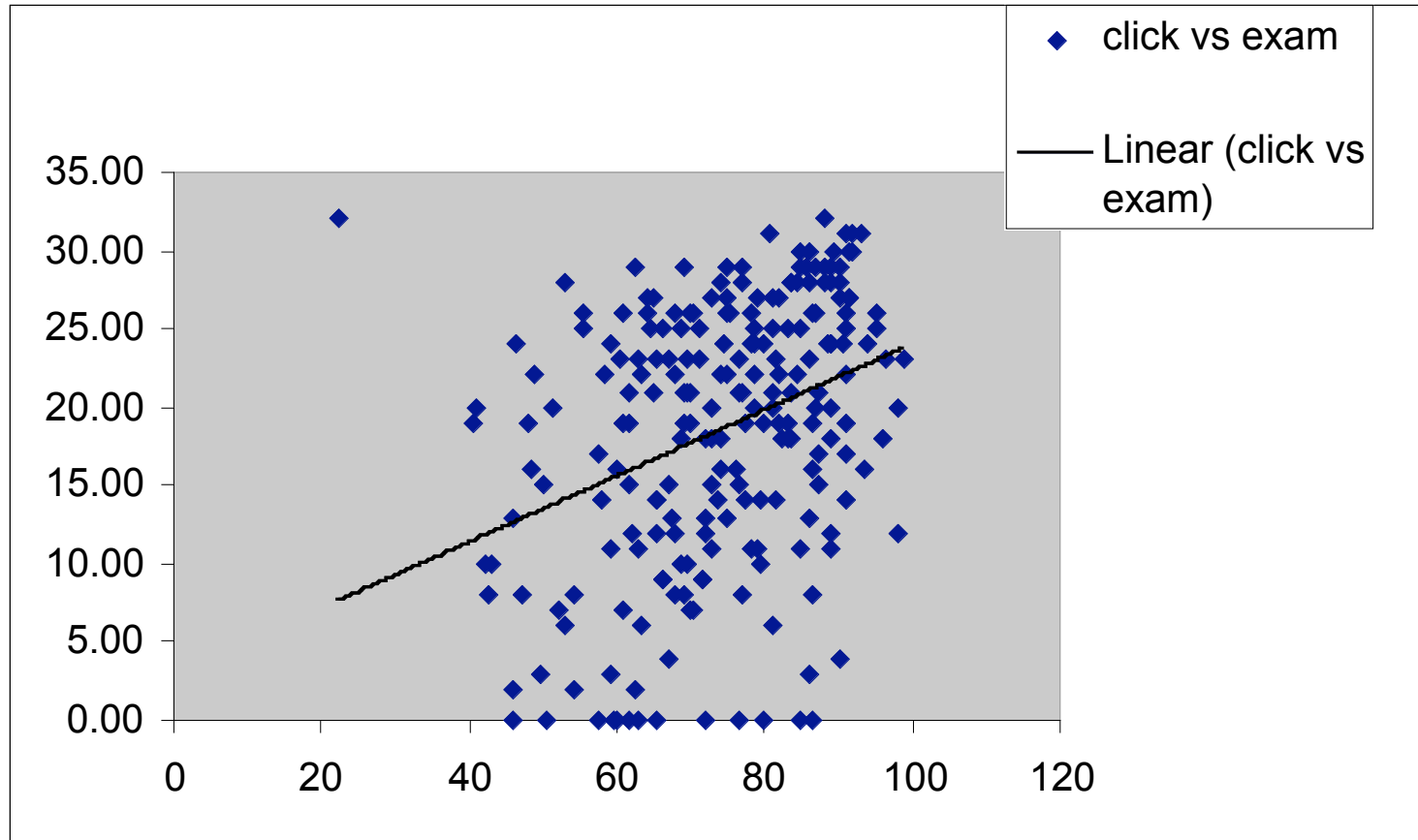
General Microbiology Fall 2005

I feel that the clicker questions help me to learn the course material



General Microbiology 2006

Total clicker points to date



Exam 1 Grade

Spring 2006 General Microbiology

Total # clicks so far this semester vs Exam 1 grade

Student Comments

I felt that the clicker questions were a good way of getting the class involved and I felt that they did particularly help me. Especially since my mind tends to wander every now and then during class not of my own control, its nice to have chances to actively participate in the lecture in order to snap my attention back toward the material.

I like them, it adds insight on tough topics in lecture.

Gives me time to think and take a break from the sometimes monotonous chore of taking notes.

It makes students to **THINK** about the material, instead of just listening to the correct answer given by other students.

Student Comments

I thought the clicker was a SERIOUS waste of money...It more so hindered my learning as opposed to helped it, because I felt we covered less material in class because we were doing clicker questions.

I feel like the clickers force students to come to class. These students who are forced are those who don't keep up with the work in class. These students are the ones who come to lecture and talk and distract other students. These students would not come to lecture if it weren't for the clickers.

It would be better if we knew right away if our answer went through

I rather work harder to obtain an understanding than pay \$50 for a clicker than I am bound to lose. My parents second that comment.

Faculty Perspective - PROS

- Increased participation by all students
- A more accurate idea of the level of student understanding
- Regular questions break up lecture
- More opportunities for in-class discussion

Faculty Perspective - CONS

- Cost to students (\$45), especially since our classes also have lab fees
- Receivers do not reliably pick up every response (~3% responses missed)
- Short battery life
- Cannot import responses directly to WebCT

Recommendations

- Incorporate clickers into freshman courses to expose them to the technology and encourage their use in future courses.
- Develop a method for directly exporting clicker data to a grade database
- Investigate options for reducing cost to students and improving reliability of receiver.