

# PRS - Six Years Following its Introduction



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## Drawbacks of One-to-Many Lecture:

- Learning needs inspiration, big or small, and inspiration cannot be scheduled.
- lack of interactivity

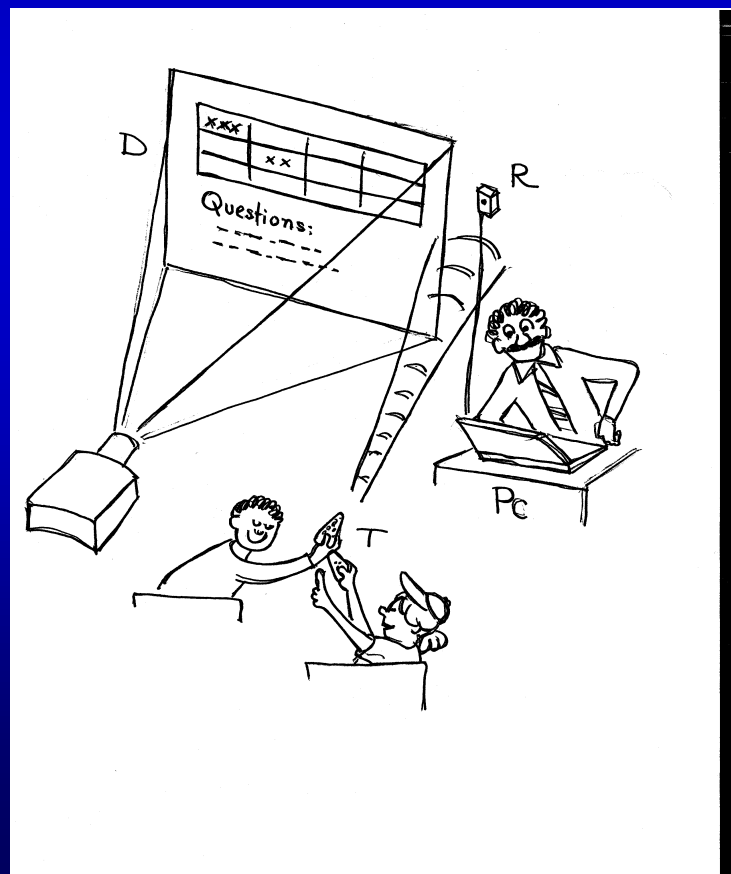
## Remedies:

- Small class - use Socratic dialogue.
- Large class - use interactive engagement of Q&A's and a classroom learning tool like the PRS (allow peer instruction and contingent teaching)

# Introduced PRS

It is a wireless response system based on the IR technology:

- that allows each and every member of the audience to respond privately to a question or prompt,
- each and every response is registered in a PC
- the results are summarized and displayed instantaneously for all to see.



(54) **FREE-FORMING ONE-WAY NETWORK**

(75) Inventors: **Nelson Cue; Che Kin Lee; Wing Yim Tam**, all of Clear Water Bay (HK)

(73) Assignee: **The Hong Kong University of Science & Technology**, Hong Kong (HK)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **08/895,043**

(22) Filed: **Jul. 16, 1997**

(51) **Int. Cl.** ..... **H04Q 7/20**

(52) **U.S. Cl.** ..... **455/458; 455/2; 455/500; 455/508; 455/466; 434/336; 434/350; 434/351**

(58) **Field of Search** ..... **455/2, 415, 426, 455/458, 466, 500; 370/312, 413, 349; 434/319, 334, 336, 350, 351, 362**

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*Primary Examiner*—Stella Woo  
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(74) *Attorney, Agent, or Firm*—Burns, Doane, Swecker & Mathis, L.L.P.

(57) **ABSTRACT**

A one-way or single-channel communication network utilizing electromagnetic radiation signals of a fixed single or narrow-band frequency in free air space consists of a plurality of transmitters and a central receiver in which each message is encoded in a wave train and is tagged with a sender identity (ID). The central receiver, which can be a single unit or a plurality of units connected in cascade, detects the messages in the free air space and send them along to a central processing unit (CPU) for message handling. Possible additional features of the system are: an option of a small display panel on the individual transmitter to show the message to be sent plus the number of attempts a message was sent within a preset time; a separate feedback segment, such as a colour change of a characteristic symbol on a central display screen visible to the sender, providing a confirmation that the message has been received; each symbol on the display screen showing the number of times a message was received from the corresponding transmitter within a present time; and a built-in option to either retain or black out the ID tag on the messages to be processed by the CPU. The free forming aspect of the system stems from the portability of the ID-encoded transmitters which enables any combination of transmitters to form a communication network, and a plurality of such combinations to form a plurality of networks.

# How Effective and Universal is PRS?

In Yr-1 Mechanics, Hake showed interactive engagement more than doubling the measured learning based on standardized test results.

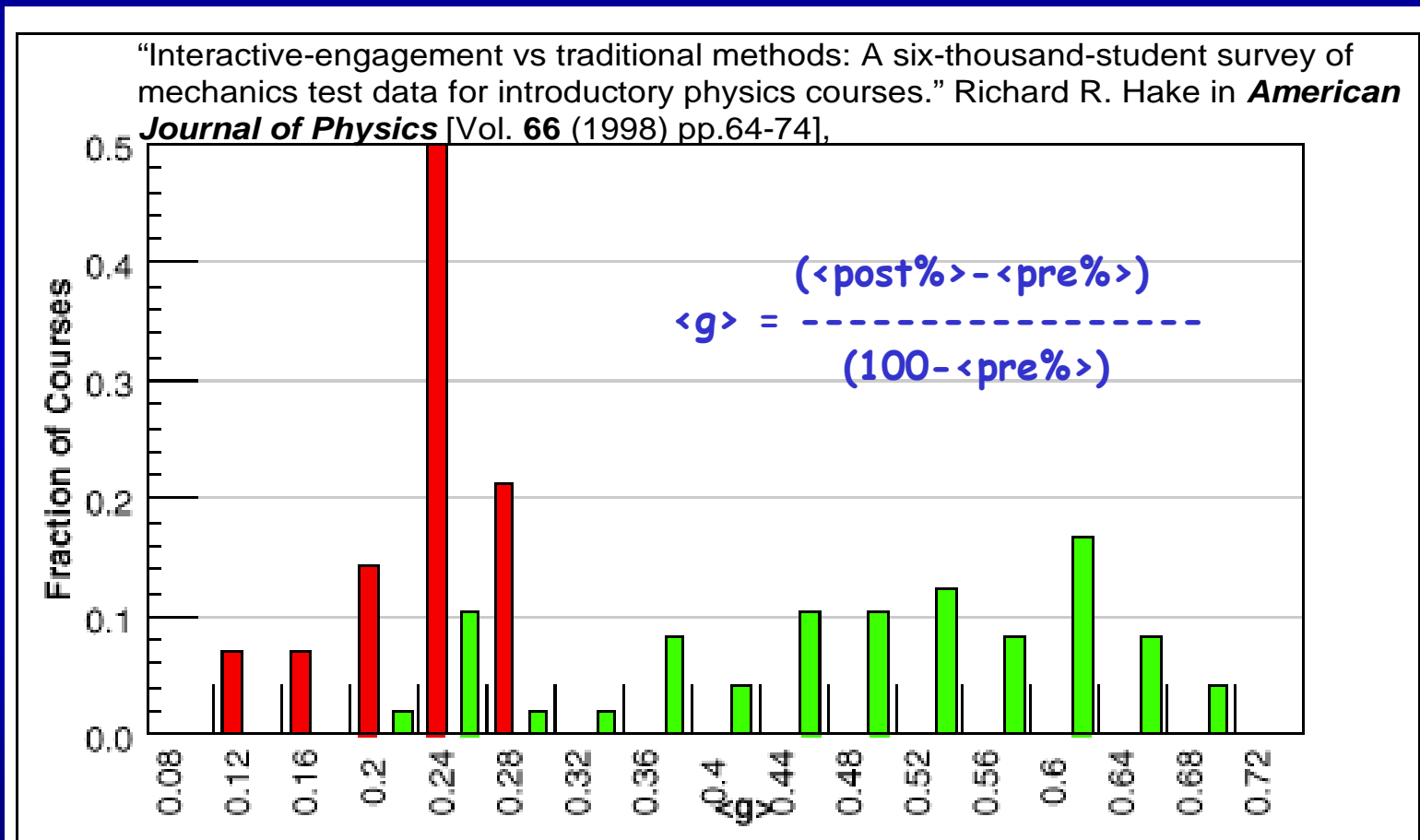


Fig. 2. Histogram of the average normalized gain  $\langle g \rangle$ : dark (red) bars show the *fraction* of 14 traditional courses (N = 2084), and light (green) bars show the *fraction* of 48 interactive engagement courses (N = 4458), both within bins of width  $\delta\langle g \rangle = 0.04$  centered on the  $\langle g \rangle$  values shown.

## Partial List of PRS Users in N. America

Arizona State University  
California Polytechnic State University  
California State University, Fullerton  
Cooper Union  
Cornell University  
Dartmouth College  
Duke University  
Florida State University  
Harvard University  
Harvard Business School  
Illinois Institute of Technology  
Indiana University  
Iowa State University  
Kansas State University  
Lake Forest College  
Massachusetts Institute of Technology  
Michigan State University  
Minnesota State University  
North Dakota State University  
Northeastern University  
Notre Dame  
Old Dominion University  
Oregon State University  
Rice University

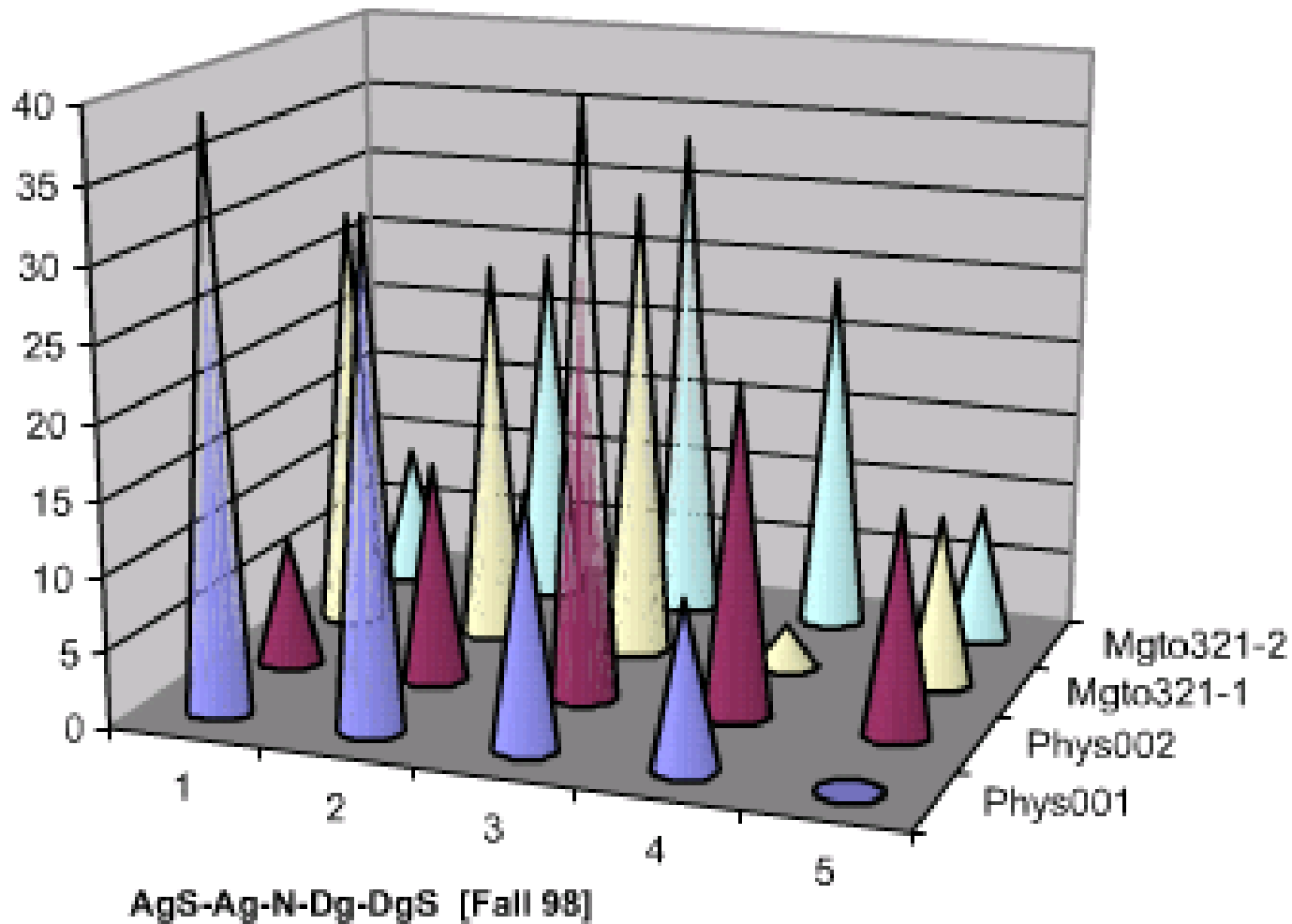
Rutgers University  
Stanford University  
Universidad Central del Caribe (PR)  
University of Arizona  
University of British Columbia (Canada)  
University of California, Berkeley  
University of Illinois, Urbana-Champaign  
University of Kentucky  
University of Maryland  
University of Massachusetts, Amherst  
University of Minnesota, Duluth  
University of Nebraska-Lincoln  
University of Nevada, Las Vegas  
University of North Carolina, Ashville  
University of Pennsylvania, Philadelphia  
University of South Florida  
University of Tennessee  
Vanderbilt University  
Wake Forest

## Other regions

Scotland : University of Glasgow  
University of Strathclyde  
HK : Baptist U, HKU, HKUST, PolyU  
South Africa, Israel, Germany, Italy, Greece,  
Turkey, Australia, Indonesia and China.

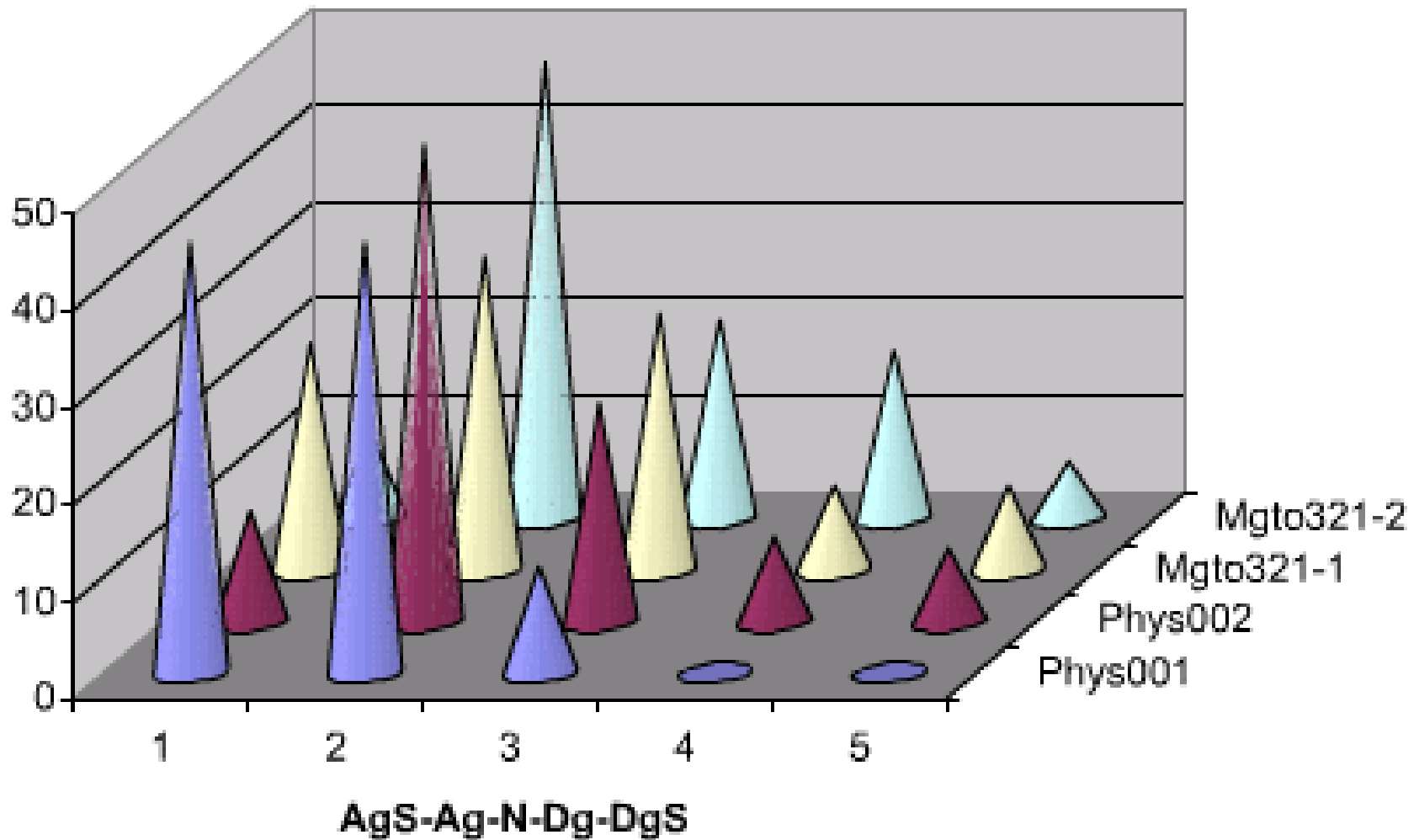
# HKUST Students Survey1 - 2000

Attend PRS classes more regularly



# HKUST Students Survey2 - 2000

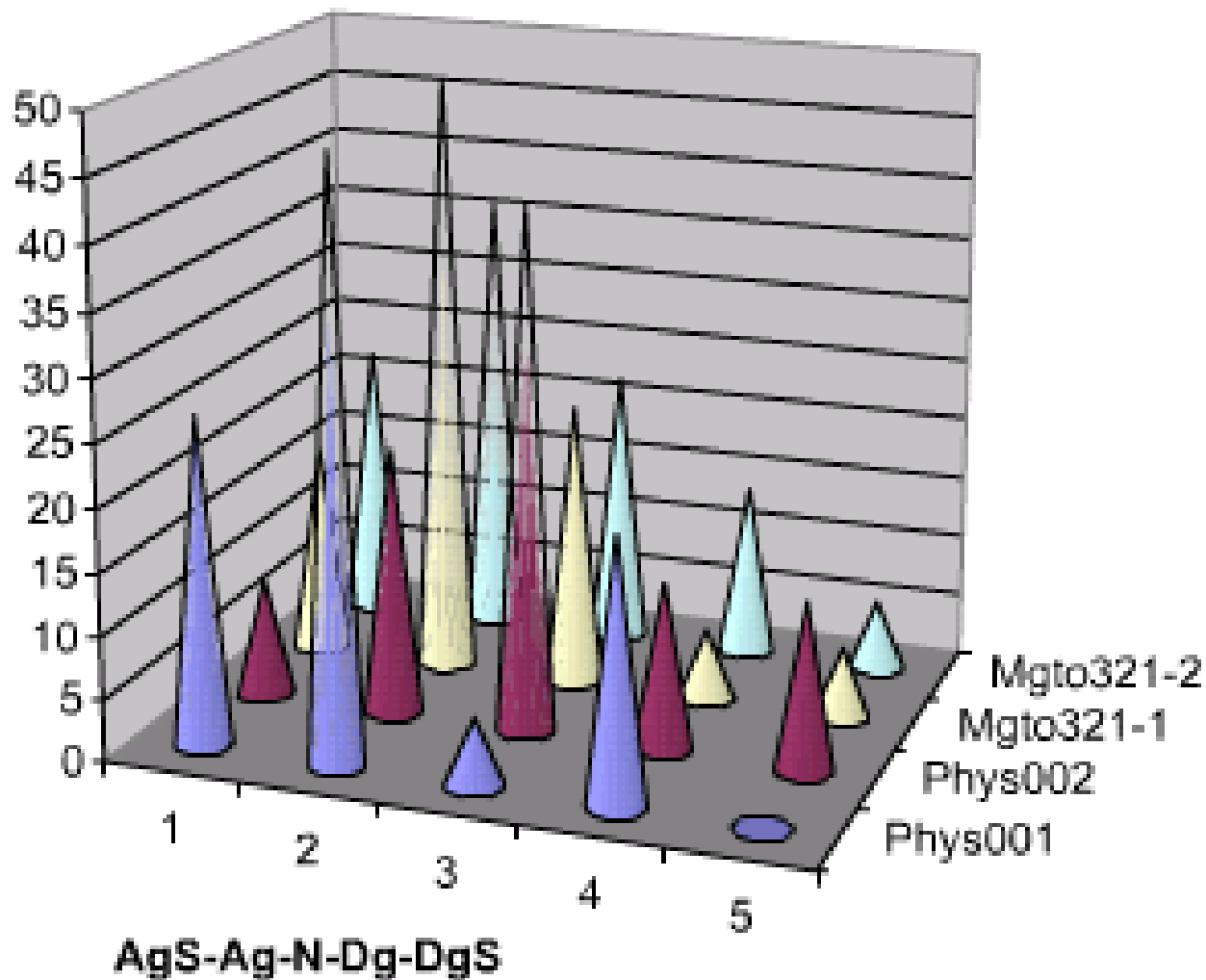
Do more thinking in PRS classes





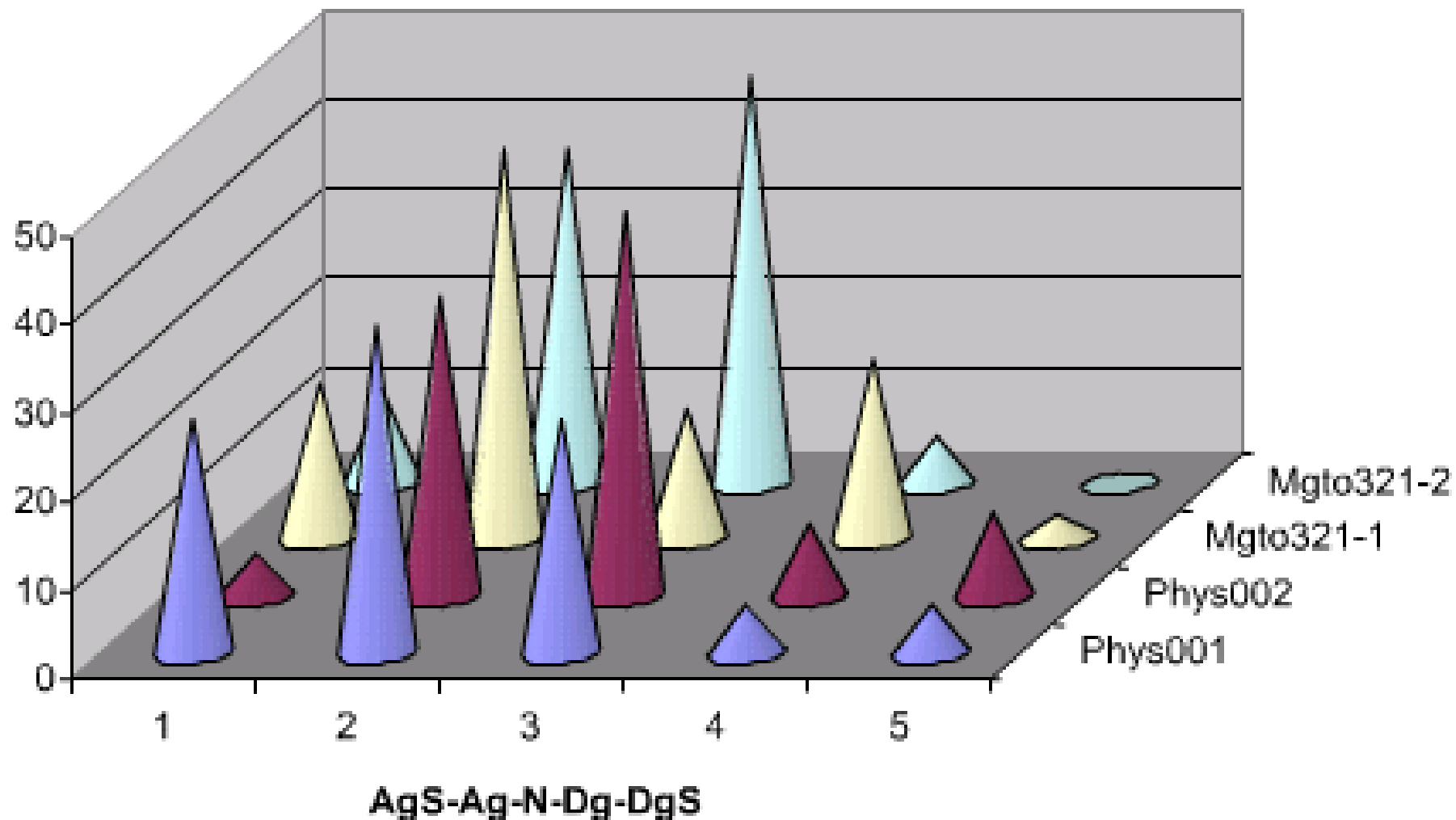
# HKUST Students Survey3 - 2000

Knowing the responses of classmates increases my interest

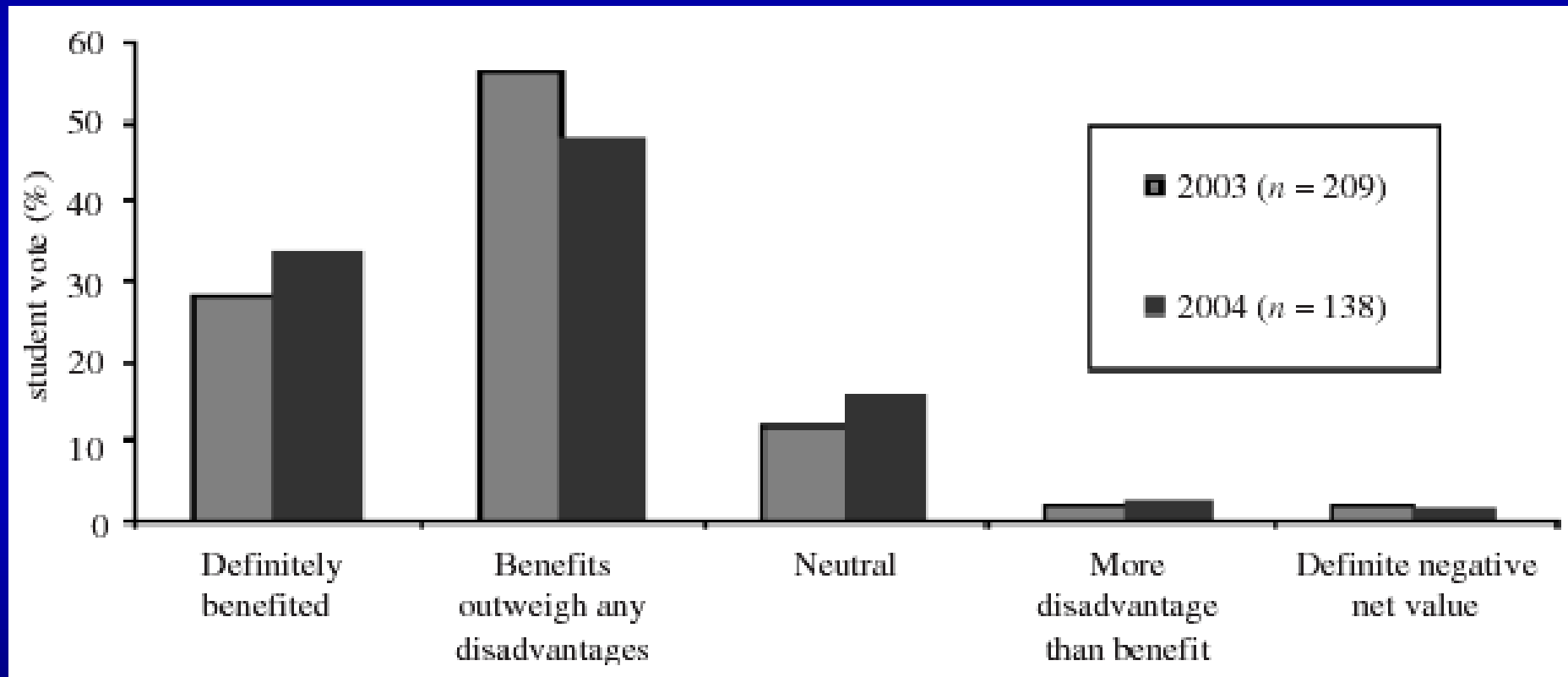


# HKUST Students Survey4 - 2000

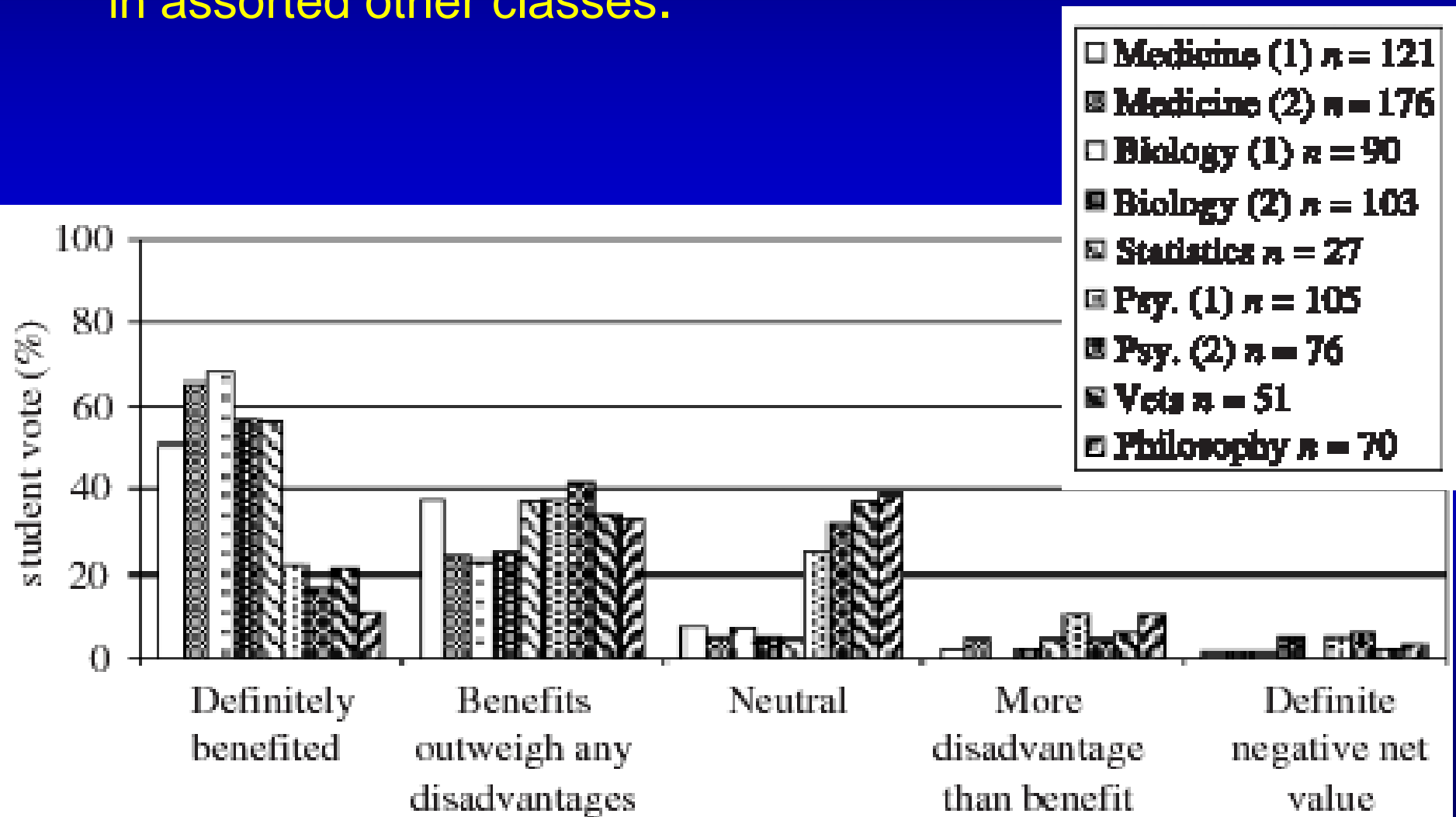
PRS helps me learn in greater depth



- ‘What was, for you, the balance of benefit vs. disadvantage from the use of the handsets in your lectures?’ [Comp Sci]



- “Responses to the net value question in assorted other classes.”



# North Dakota State U:

***The NDSU pilot PRS project produced good survey results:***

To "I do more thinking during PRS classes than in lecture classes," **82.1%** respondents agreed or strongly agreed.

To "some PRS questions make me try hard to make sense of the subject matter," **89.7%** agreed or strongly agreed.

To "I prefer the more traditional lecture approach over the newer PRS approach," **91.4%** disagreed or strongly disagreed.

Survey Results from [Dr. Jeffery Gerst](#)

## Recent developments:

- Java version SW that complemented the original VB version
- multi-media questions
- separate display windows for students and instructor
- option for numerical answer
- option for self-paced test taking
- distribution through book stores
- Publishers producing textbooks with MC questions and bundling either a PRS handset or a handset rebate coupon with the textbook.

### The last two points

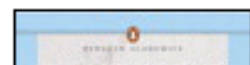
- minimize the cost to the institutional users.
- eliminate the need for distribution/collection of handsets.

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# Ultimate Questions: Thinking About Philosophy



Nils Ch. Rauhut, *Coastal Carolina University*

**For Philosophy**

**Allyn & Bacon/Longman CourseCompass Instructor QuickStart Guide, 3/E**  
 by Robert Allyn & Bacon  
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# Summary1 :

## PRS is a tool for active learning in the classroom

- 100% participation in Q&A sessions;
- instant feedback & reinforcement;
- automatic attendance check;
- automatic recording of answers;
- check understandings;
- challenge shy students;
- gender-blind responses;
- color-blind responses;
- facilitate peer instruction;

## PRS is a tool for electioneering, for instant polling and for rating by audience

- in training sessions for immediate feedback and reinforcement;
- in elections for instant tabulation of votes;
- in new product demos for on-the-spot opinions;
- in contests for rating by audience .



## Summary2:

Feedback to teacher for contingent teaching

PRS become as common as a pen & paper sets?

A side issue – an old lesson re-learned

- There is a S-curve for the adoption of any new device/approach
- PRS - commercially available and first campus-wide adoption in 1998.
- A useful device like the PRS still took 5.5 years to be at the rising slope of the S-curve.
- The incentive of being recognized as a good teacher is insufficient if the perceived "barrier" for the effort is large
- The key factor in lowering this "barrier" is the recent availability of textbooks with MC questions