On April 30, 2006 we discussed some of the major points of the *Blackboards, PowerPoint and Tablet PCs in the Classroom* paper at a conference on *Scholarship, Leadership, and Innovation* organized by the University of Toronto Faculty Association. The majority of the participants were faculty who are members of the "Teaching Stream" at the University of Toronto; all participants by their presence demonstrated a deep interest in pedagogy.

We had about 25 participants at the session, and asked the participants three questions which they answered using "clickers."

This document is a pdf of the PowerPoint slides used in the presentation. We have inserted the bar charts of the question answers into the appropriate slides; the vertical axis of the bar charts is percentage of responses.

We also introduced the subject of *saccades* on the blackboard in the room. There is no PowerPoint slide for this part of the discussion.

In addition, the PowerPoint was delivered on a Tablet PC, and part of the talk involved using the *Journal* program on the Tablet, and also demonstrated adding "digital ink" to the PowerPoint presentation in real time.

If you found this document first, here is the location of the full paper:

http://www.upscale.utoronto.ca/PVB/Harrison/BlackboardPptTablet/BlackboardPptTablet.pdf

Blackboards, PowerPoint, and Tablet PCs

A discussion of the display of visual information in the classroom

Jason Harlow, David M. Harrison, Ruxandra Serbanescu: Department of Physics

Please pick up a clicker from the front

Clickers are generously supplied by: i>clicker

Blackboards, PowerPoint, and Tablet PCs

- Review of studies of eye movements of subjects who are reading
- Case 1: 1,000 First Year Physics students in Convocation Hall
- Case 2: 85 Liberal Arts students in a 200-seat lecture hall
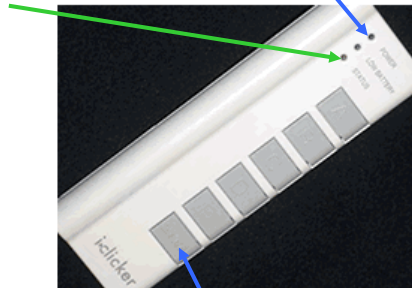- Case 3: 35 Second Year Physics students in a 95-seat classroom

The "Clickers"

Status Light

Power Light

When we start asking you questions:

• Will flash green when your response is registered

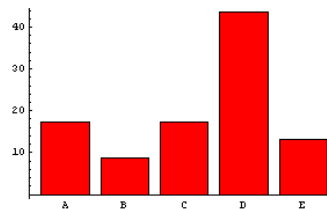• Will flash red if your response is not registered

On/Off Switch
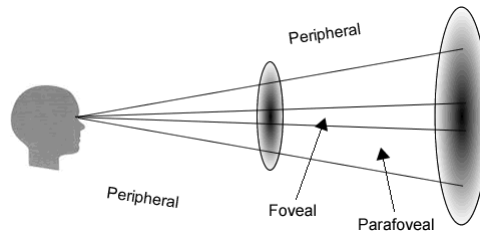
Please turn on your clicker now

Question

In an undergraduate classroom, using PowerPoint as the primary medium for delivering visual information is a good choice.

Choose the "best answer":

A. Agree
B. Disagree
C. Depends on class size
D. Depends on academic discipline
E. Depends on factors other than those listed above

Three Visual Fields

Foveal: extends ~ 2 degrees from centre — Visual acuity best

Parafoveal: extends ~ 5 degress from centre — Visual acuity not as good

Peripheral: extends nearly 90 degrees from centre — Visual acuity worst

Regressive Saccades

- Jump back to re-read material
- Number increases with the difficulty in understanding the material being read
- Sometimes jump back many lines
- Very large regressive saccades involve a spatial memory of *where* the text is
- If the previous text is no longer visible, reading becomes more difficult
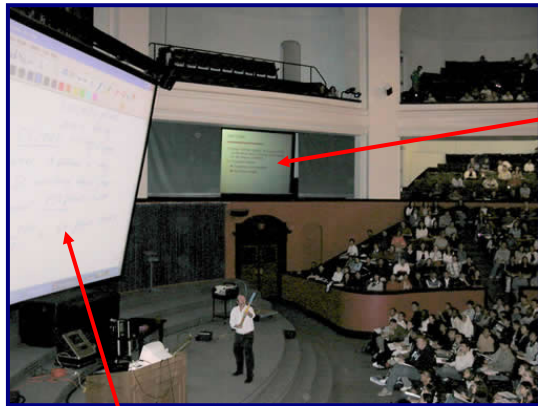 - Especially for subjects with a poor working memory

Possible Problems With PowerPoint in the Classroom

- Once a slide is gone, it can not be re-read
  - Unless they are printed in hardcopy in advance

From the Provost's "White Paper" of 2004

- "Students make it clear that simply replacing the use of the blackboard by a PowerPoint presentation offers them the opportunity to sleep in the dark…"
- "… even awake, they miss a key element in the learning process: observing a professor think in real time, as he or she develops material step by step."

Teaching First Year Physics in Convocation Hall

One of Two Side Screens

Main Screen

Teaching First Year Physics in Convocation Hall

- Develop material on the Main Screen with the Journal program on the Tablet PC

- Major points developed on the Tablet are then shown on the Side Screen

    – We observe students glancing back and forth between the two screens

In a survey in the Spring of 2005, 65% of the students rated this use of the Tablet PC as useful for their education.

Mean = 4.96/7 where 7 ≡ "invaluable"

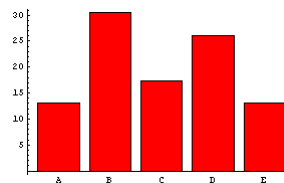## Possible Problems With PowerPoint in the Classroom

- Once a slide is gone, it can not be re-read
  - Unless they are printed in hardcopy in advance
- The talk is "canned"
  - Even with animations like **this**
- Does PowerPoint impose a particular cognitive style?

Question

In an undergraduate classroom, using PowerPoint as the primary medium for delivering visual information is a good choice.

Choose the "best answer":

A. Agree
B. Disagree
C. Depends on class size
D. Depends on academic discipline
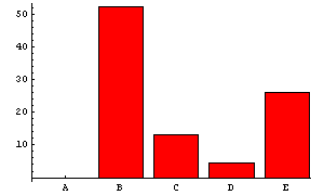E. Depends on factors other than those listed above

Question

The most important reason I use a blackboard in a class is:

Choose the "best answer":

A. It's low-tech
B. Real-time development of material
C. Large visual field – lots can be displayed at once
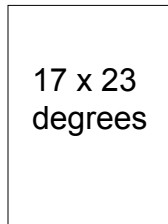D. Easy to prepare and deliver
E. I do not use blackboards.

Comparing Visual Fields

*All pictures drawn to the same *angular* scale*
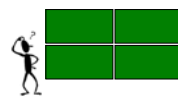
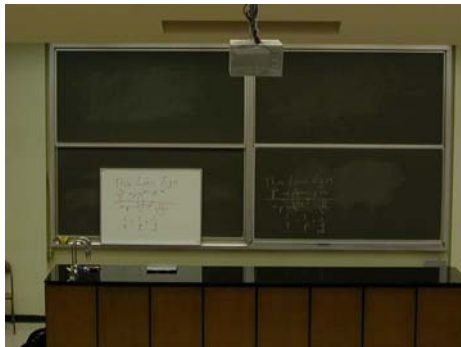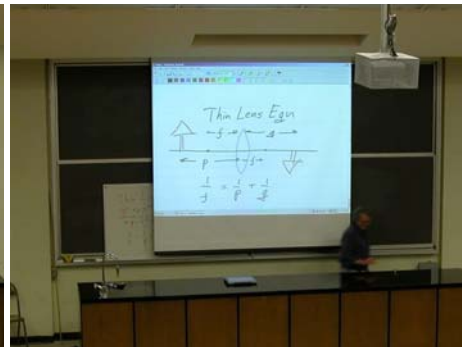| Sheet of Paper, held 32 cm away from eyes:		4 blackboard panels, each 2.2 x 1.1 m	Projection Screen in room
17 x 23 degrees	Back of 100 seat classroom (9 m away):		
	Back of 200 seat classroom (15 m away):		
	Back of 1700 seat auditorium (about 60 m away):		7x5m screen

Our experience in a 200 seat classroom

- We taught Physics for the Humanities to 85 students
- Most lectures: Tablet PC presentation, with occasional images and animations
- 1 lecture: Blackboard presentation
- Student survey showed strong preference for Tablet PC. Students said it was "more readable".

View from the back of a 200 seat classroom, 15 m away
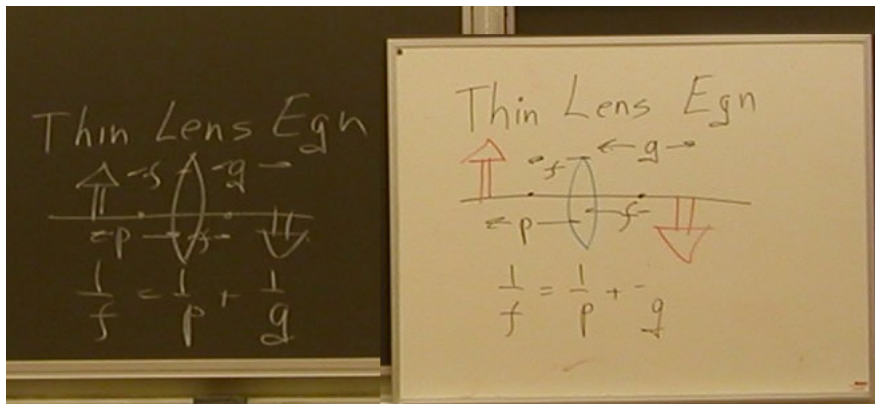

Whiteboard and Blackboard

Tablet PC

Our experience in a 100 seat classroom

- **Taught second year physics to 35 students.**
- **Used four presentation methods:**

  1) Blackboard writing + Power Point
  2) Tablet PC writing + Power Point
  3) Blackboard writing + Ink annotations on Power Point
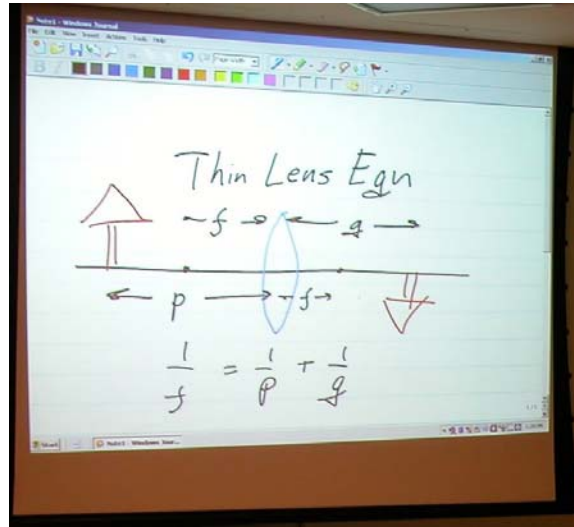 4) Ink annotations on Power Point only

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Method 1, 14 lectures: Blackboard writing using PowerPoint on the side-screen.
  Room lights all on

–**The Class: very active**

Method 2, 6 lectures: Tablet PC writing OR
   PowerPoint on the side-screen
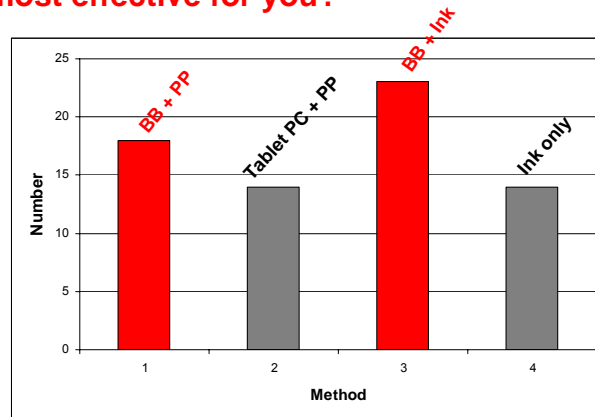   Room lights dimmed

– **The Class:**

**Survey: How would you rate the blackboard writing as
   compared with writing on the Tablet PC?**

62% voted in favor of the blackboard

• **Methods 3 and 4, 15 lectures:** blackboard
   writing, plus PowerPoint with "Ink"
   annotations on the side-screen

Surveyed the class again: which of presentation methods was most effective for you?

BB – Blackboard writing
PP – Power point
Ink – "Ink" annotations on Power Point

- **Students' comments:**

  – In-class learning is better with the blackboard than the Tablet PC;
  – Lecturer is more dynamic, class is more animated when the blackboard is used;
  – The Journal files are useful in a long run, but cannot replace the classroom explanations;
  – The Tablet PC displays too little at a time.

Blackboards

- **Readability** of writing depends on:
  – Thickness of strokes
  – Distance of reader from board
  – Size of letters
  – Lighting on board
  – Cleanliness of board
- Before settling on a style, check the readability from the back of your room.
- In general, distance of student from the board should not exceed about 10 m

Conclusions

Important factors in classroom presentations:

• Get as much as possible in front of the students at once so they may re-read previous material

• Develop material in real-time

• Keep room lighting as bright as possible

Surprise:

• Many classroom's blackboards are not acceptable

 A Tablet PC with another medium (such as an overhead) for displaying previously developed material can work

To Read More …

- Google the title of this talk
  - The first link is to a version of today's session given by Jason a few months ago
  - The second link is to a pdf of a paper discussing these issues.