Gesture Friendly Interfaces

and other Tools to
Help Teachers Teach with Gesture
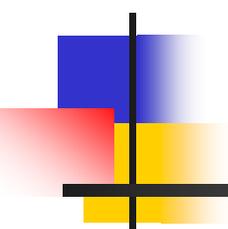
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School of Information Technology

Overview

- The role of technology in learning
- The role of gesture in teaching, learning, and communicating
- New tools for teaching with gesture
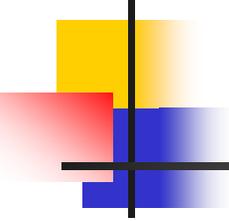
Educational Technology

- Want students to do computer-based learning
  - Individualized lessons
  - Immersive visualizations
  - Interactive and in-depth explorations
  - Independent learning experiences
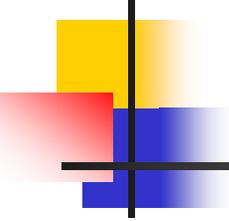
A Conjecture

- Students will (first/primarily) use the resources that their teachers teach with
- Teachers have to teach with (the same) educational technology

Classroom Option 1

- Computer lab with individual instruction
  - Most tools designed with this assumption
  - Expensive and inefficient
  - Still want occasional face-to-face, whole-class teaching in this environment
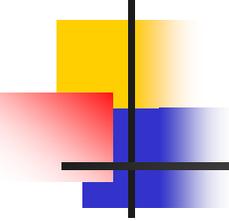
Classroom Option 2

- Presentation PC and projector
  - Educational tools not often designed for this environment
  - Leads to poor presentation of material and technology
  - Interface design not suited for classroom teaching and gesture production
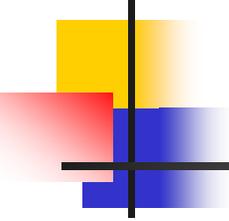
The Role of Gesture in Communication

- Some ideas are best expressed with gesture (Kranstedt, Kühnlein, and Wachsmuth)
- Inability to gesture can lead to interference of speech production (Mayberry and Jaques)
- Increases complexity of spoken description

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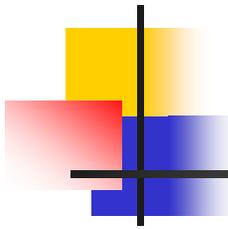
The Role of Gesture in Teaching

- Students learn better with gesture (Goldin-Meadow, Kim, and Singer)
  - Matching gesture improves uptake (compared to speech alone)
  - Mismatching gesture disrupts uptake
    - Students may uptake incorrect strategy communicated by gesture
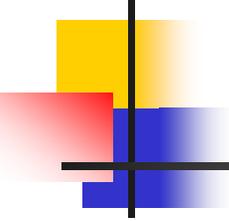
The Role of Gesture in Mathematics

- Some mathematical concepts are physical – fictive motion (Núñez)
  - Approaching limits
  - How can this be described without gesture?

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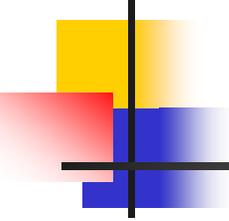
Classroom Teaching

- Want to…
  - Engage students
  - Have eye-to-eye contact
  - Create dynamic visualizations
  - Simultaneously perform relevant/required gestures

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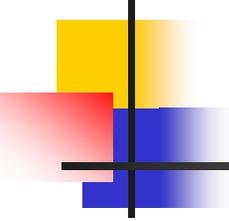
Teaching with Technology

- End up…
  - Concentrating on PC screen
  - Talking into the PC
  - Focusing on the mouse/keyboard interface
  - Disengaging from the class
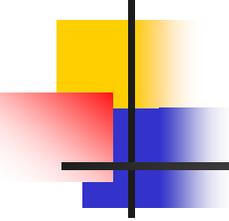
Keys to Teaching with Technology

- Non-intrusive interface

- Flexible material presentation
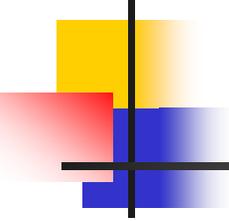
Gesture Friendly Interfaces

- Low-cost/low-tech solution

- Viable in most computer-equipped classrooms

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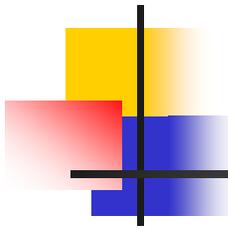
Designing GFIs

- Pick an important feature of the learning object that will be highlighted during a classroom presentation
- Develop a simple way to control this feature

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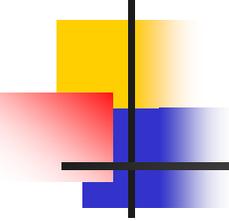
GFI Example

- Choosing a Cell Phone Plan – Lines and Intersections
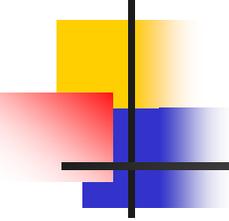
Designing Flexible Material

- Primary complaint of learning objects from pre-service teachers is that the material cannot be built up towards the final state

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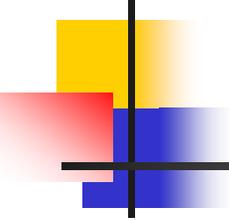
Inflexible Example

- Fun and Sun Rent-A-Car
  - http://math.rice.edu/~lanius/Algebra/rentacarja.html

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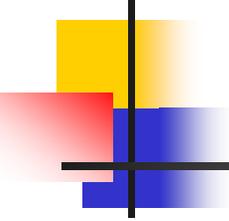
Flexible Example

- Choosing a Cell Phone Plan – Data Collection
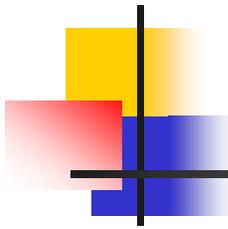
Improvements

- Flexible design allows incremental in-class teaching
- GFI makes whole-class, face-to-face teaching possible
- New learning object provides corrective feedback
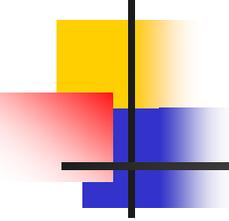
Other Tools

- Digital Mathematics Performances
  - http://www.atkinson.yorku.ca/~sychen/research/math/DMP.html
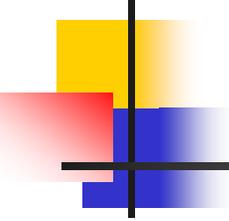
Digital Mathematics Performances and GFIs

- How will teachers be trained to use GFIs?

- Key features are physical, so key training likely visual
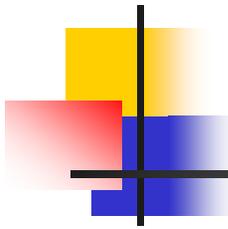
Summary

- Gesture is an important part of teaching and learning

- Classroom presentation is an important part of learning object design

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