I'D LIKE TO START WITH A DIAGRAM.

IT'S A BUNCH OF SHAPES CONNECTED BY LINES.

NOW I WILL SAY SOME IMPRESSIVE WORDS.

SYNCHRONIZED INCREMENTAL DIGITAL INTEGRATED DYNAMIC E-COMMERCE SPACE.

ANY QUESTIONS?

MAY I HAVE A COPY OF YOUR PRESENTATION?

THE RESULTS OF MY EXPERIMENT ARE DISTURBING.
COMP272: Theory of Computing - A Study on the Learning Effectiveness of Visualizations

Rudolf Fleischer

Department of Computer Science
Fudan University, Shanghai
Metamorphosis of the Cube

Erik Demaine
Martin Demaine
Anna Lubiw
Joseph O’Rourke
Irena Pashchenko
COMP272 - Theory of Computing

- Spring 2002, 2003, 2004
- 99 students
- Just-in-Time Teaching
- Topics: finite automata, pushdown automata, Turing machines
- Material is rather abstract (mathematical)
Learning Styles

- **Visual/Verbal**: Text and picture
- **Visual/Nonverbal**: Picture
- **Tactile/Kinesthetic**: Hands-on exercises
- **Auditory/Verbal**: Listen
- Questionnaire at [http://www.metamath.com/multiple/multiple_choice_questions.cgi](http://www.metamath.com/multiple/multiple_choice_questions.cgi)
- **Example**
Learning Styles in COMP272

- Visual/Verbal: 42
- Visual/Nonverbal: 24
- Tactile/Kinesthetic: 11
- Auditory/Verbal: 14
Learning Styles in COMP272
Animation Tests

• 4 tests
• Immediately after material was taught
• Start with 6 questions
• Then all students see verbal explanation
• Then half of the students (random) see animations
• Then 6 questions similar to first batch
Bloom Taxonomy of Visualizations
(Naps et al., ITiCSE 2002 and 2003)

• **Viewing:** definitions, step-by-step explanations of algorithms
• **Responding:** step exercises
• **Changing:** run algorithms on own input data
Bloom Taxonomy of Visualizations
(Naps et al., ITiCSE 2002 and 2003)

- **Viewing**: definitions, step-by-step explanations of algorithms
- **Responding**: step exercises
- **Changing**: run algorithms on own input data
Lot’s of Statistical Data

• We recorded all inputs and mouse clicks with time stamps
• We know all right/wrong answers
• We know how long students spent on questions/animations
• We know whether they chose to see animations twice
• …
Average Improvement

Test 1  Test 2  Test 3  Test 4

VL  NVL
More Time = More Success?
Why?

• Verbal explanations too good?
• Animations not good enough?
• Wrong questions?
• Are non-visual learners more clever?
• What did our tests measure?

We need help from a psychologist
More Studies

• COMP272, Spring 2005 (?)
• Soongsil University, Seoul, 2004
• ???
Thank You!
The End