shift focus from “teaching” to helping students learn
Outline

• Education
Outline

• Education

• Peer Instruction
Education
lectures focus on delivery of information
education is not just information transfer
education is not just information transfer

1990 FCI posttest
education is not just information transfer
Education

change in score, $S_f - S_i$ (%)

initial score, $S_i$ (%)
### Education

<table>
<thead>
<tr>
<th>change in score, $S_f - S_i$ (%)</th>
<th>100</th>
<th>80</th>
<th>60</th>
<th>40</th>
<th>20</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>initial score, $S_i$ (%)</td>
<td>0</td>
<td>20</td>
<td>40</td>
<td>60</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

![Bar chart showing change in score vs initial score](image.png)

- **1990 combined**
change in score, $S_f - S_i$ (%) vs. initial score, $S_i$ (%)
only one quarter of maximum gain realized

\[ g = \frac{S_f - S_i}{1 - S_i} \]

Education

not transfer but assimilation of information is key
conventional problems misleading
conventional problems misleading

Calculate:
(a) current in 2-Ω resistor
(b) potential difference between P and Q
are the basic principles understood?
are the basic principles understood?

When $S$ is closed, what happens to:

(a) intensities of $A$ and $B$?

(b) intensity of $C$?

(c) current through battery?

(d) potential difference across $A$, $B$, and $C$?

(e) the total power dissipated?
Education

![Histograms comparing conventional and conceptual learning methods.](image-url)

- **Conventional Learning:**
  - Average score: 6.9
  - Score distribution:
    - Count for scores 0-2: low
    - Count for scores 4-6: moderate
    - Count for scores 8-10: high

- **Conceptual Learning:**
  - Average score: 4.9
  - Score distribution:
    - Count for scores 0-2: high
    - Count for scores 4-6: moderate
    - Count for scores 8-10: low
So what should we do?
Give students more responsibility for gathering information...
Peer Instruction

Give students more responsibility for gathering information... so we can better help them assimilate it.
Main features:

• pre-class reading

• in-class: depth, not ‘coverage’

• ConcepTests
Peer Instruction

ConcepTest:

1. Question
2. Thinking
3. Individual answer
4. Peer discussion
5. Revised/Group answer
6. Explanation
is it any good?
Results

first year of implementing PI

![Histogram showing score distribution with count on the y-axis and score on the x-axis. The label 1991 FCI pretest is visible.](chart.png)
Results

first year of implementing PI

1991 FCI posttest
Results

first year of implementing PI

![Bar chart with score on the x-axis and count on the y-axis, showing data for 1991 combined.]
Results

The diagram shows the relationship between the initial score ($S_i$) and the change in score ($S_f - S_i$), where $g = \frac{S_f - S_i}{1 - S_i}$. The graph includes data points and a line that describes the perfect score scenario.
Results

\[ g = \frac{S_f - S_i}{1 - S_i} \]
Results

\[ g = \frac{S_f - S_i}{1 - S_i} \]

Results

\[ g = \frac{S_f - S_i}{1 - S_i} \]

what about problem solving?
Results

1985 exam scores

![Bar chart of exam scores](image)
Results

1991 exam scores
Results

1985/91 exam scores
So better understanding leads to better problem solving!
So better understanding leads to better problem solving!

(but “good” problem solving doesn’t always indicate understanding!)
Traditional indicators of success misleading
Summary

Traditional indicators of success misleading

Education is no longer about information
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