Memorization or understanding: are we teaching the right thing?

Queen’s University
Kingston, ON, Canada, 11 November 2011
Think of something you are good at — something that you know you do well.
Think of something you are good at — something that you know you do well.

*How did you become good at this?*
How do we learn?

Became good at it by:

1. practicing
2. lectures
3. trial and error
4. apprenticeship
5. other
How we teach...
Learning spaces
Learning spaces
Education
Education

Some people talk in their sleep.
Some people talk in their sleep.

Lecturers talk while other people are sleeping.

Albert Camus
Education

lectures focus on information transfer...
Education

education is not just information transfer

![Histogram](image-url)
education is not just information transfer

1990 FCI posttest
education is not just information transfer
conventional problems misleading
Education

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

conventional

conceptual

average 6.9

average 4.9
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

1991 FCI pretest
Results

first year of implementing PI

1991 FCI posttest
Results

first year of implementing PI

1991 combined
what about problem solving?
Results

1985 exam scores

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<th>count</th>
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Results

1991 exam scores

count

exam score (%)
Results

1985/91 exam scores

- Exam scores are represented on the x-axis, ranging from 0 to 100.
- The y-axis represents the count.
- The bars show the distribution of exam scores for the years 1985/91.
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!)
Funding:
National Science Foundation

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