Assessment: The silent killer of learning
Assessment: The silent killer of learning

@eric_mazur

iOnTheFuture4 Conference
Sydney, Australia, 20 August 2016
kosten
1. die Kosten (pl.)
2. kostbar
3. kostlich

krank
1. die Krankheit, —en

cow

das Kind, —(e)s, —en

magnificent
1. magnificent
2. splendid

glory

der Kellner, —s, —

kennen
1. kennen
2. kennen-gekant
3. kennenlernen
4. erkennen

irreg.

kind (e)s, —en

kindlich
35% retained after 1 week
we only guarantee they’ll pass the test
assessment focussed on ranking and classifying, not on developing 21st century skills
purposes

problems
how many different purposes of assessment can you think of?
1. rate students
2. rate professor and course
3. motivate students to keep up with work
4. provide feedback on learning to students
5. provide feedback to instructor
6. provide instructional accountability
7. improve teaching and learning
purposes

problems
inauthentic tests

1 purposes
2 problems
what is the meaning/definition of...?
inauthentic problem solving

1 purposes

2 problems
1 purposes
2 problems
problem

outcome

1 purposes

2 problems
1. purposes
2. problems

known

problem
outcome

EDUCACION
problem \rightarrow solution \rightarrow outcome

1 purposes
2 problems
1. purposes
2. problems
1 purposes
2 problems

problem solution outcome

problem

UNKNOWKNOWN

UCACION
1. purposes

2. problems
1. purposes
2. problems

- problem
- solution
- outcome

- problem
- procedure
- answer

KNOWN
UNKNOWN
UNKNOWN
UNKNOWN
Think of thinking skills in terms of levels. The primary purposes are 1) purposes and 2) problems. The primary problems are known and unknown. The primary solutions are known and unknown. The primary procedures are remembering, understanding, applying, analyzing, evaluating, and creating.
On a Saturday afternoon, you pull into a parking lot with un-metered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.
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How long do you have to wait before someone frees up a space?
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How long do you have to wait before someone frees up a space?

Requires:
Assumptions
Developing a model
Applying that model
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- Assumptions
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**Assumptions**

**Developing a model**

**Applying that model**
On a Saturday afternoon, you pull into a parking lot with un-metered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces. On average people shop for 2 hours.

Assuming people leave at regularly-spaced intervals, how long do you have to wait before someone frees up a space?

Requires:

Assumptions
Developing a model
Applying that model
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**Assuming people leave at regularly-spaced intervals, how long do you have to wait before someone frees up a space?**

**Requires:**
- Assumptions
- Developing a model
- Applying that model
On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area, where people are known to shop, on average, for 2 hours. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

How long do you have to wait before someone frees up a space?
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\[ t_{\text{wait}} = \frac{T_{\text{shop}}}{N_{\text{spaces}}} \]
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How long do you have to wait before someone frees up a space?

\[ t_{\text{wait}} = \frac{T_{\text{shop}}}{N_{\text{spaces}}} \]
computers can do this!
1 purposes
2 problems
1 purposes
2 problems
1 purposes
2 problems

REAL problem solving
grading incompatible with real problem solving
1 purposes 2 problems
isolation
4. We will use spherical coordinates: $0 \leq \phi \leq \frac{\pi}{4}, \quad 0 \leq \theta \leq 2\pi, \quad -\infty \leq \rho \leq \infty$.

The integral is thus:

$$
\int_0^{2\pi} \int_0^{\pi/4} \int_0^\infty \rho^2 \sin \phi \, d\rho \, d\theta \, d\phi
$$

$$
= \left\{ \int_0^{\pi/4} \sin \phi \, d\phi \right\} \left\{ \int_0^{2\pi} d\theta \right\} \left\{ \int_0^\infty \rho^2 \, d\rho \right\}
$$

$$
= \left[ -\cos \phi \right]_0^{\pi/4} \cdot 2\pi \cdot \left[ \frac{\rho^3}{3} \right]_0^\infty
$$

$$
= \left( -\cos \frac{\pi}{4} + 1 \right) \cdot 2\pi \cdot 0 = 0
$$
high-stakes examinations promote cramming

1. purposes
2. problems
information stored in short-term memory
Information stored in short-term memory:

- No retention
- No transfer

1. Purposes
2. Problems
assessment produces a conflict
assessment produces a conflict

do you hire a coach or judge?
conflict resolved by:

objectivity (fairness, reliability)

1 purposes

2 problems
... but ...

List the three important concepts that the Law of conservation of Energy leads to:

1. Equilibrium (boring)
2. Thermodynamics (boring)
3. Kinetics (bow-chicka-wow-wow)

Describe the Law of definite composition (Dalton’s Law):

1. purposes
2. problems
REMEMBERING
UNDERSTANDING
APPLYING
ANALYZING
EVALUATING
CREATING

1 purposes
2 problems
only lowest order thinking skills can be judged objectively
and then there is…

- grade inflation
- cheating
mimic real life
open-book exam

1 purposes  
2 problems  
3 improvements
1 purposes
2 problems
3 improvements
1. Purposes
2. Problems
3. Improvements

Remembering
Understanding
Applying
Analyzing
Evaluating
Creating
1. purposes
2. problems
3. improvements

- Remembering
- Understanding
- Applying
- Analyzing
- Evaluating
- Creating
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Session 389314

This is the individual round; work on these questions on your own.

expression question

What is the derivative of $f(x) = 3x^2 - 6x$?

Enter an expression, e.g., $x^2$ for $x^2$, $\ln(y)-\sin(x)$ for $\ln y - \sin x$, $x/(y+1)$ for $\frac{x}{y+1}$, $(1/2)x$ for $\frac{1}{2}x$. Do not enter a complete equation.

Current team: Blue team 🕵️‍♂️ Change team 🔬 Change seat 📩 Send a message to the instructor 🔖 Join another

1 purposes
2 problems
3 improvements
This is the individual round;

**expression question**

What is the derivative of \( f(x) = 3x^2 - 6x \)?

Enter an expression, e.g., \( x^2 \) for \( x^2 \), \( \ln(y) - \sin(x) \) for \( \ln y - \sin x \).
This is the individual round;

**expression question**

What is the derivative of \( f(x) = 3x^2 - 6x \)?

[6x - 6] Submit response

Enter an expression, e.g., \( x^2 \) for \( x^2 \), \( \ln(y) - \sin(x) \) for \( \ln y - \sin x \).
What is the derivative of $f(x) = 3x^2 - 6x$?
2 focus on feedback, not ranking
objective ranking: a myth

1 purposes
2 problems
3 improvements
2 metrics, 2 results

The diagram illustrates the relationship between conceptual understanding and final grade. Points on the scatter plot suggest a positive correlation between better conceptual understanding and higher final grades.
top performers, broad grade distribution
objectivity or injustice?

1 purposes
2 problems
3 improvements
focus on skills, not content
Grant Wiggins and Jay McTighe, *Understanding by Design* (Prentice Hall, 2001)

1. purposes
2. problems
3. improvements
Traditional approach to course planning

1. purposes
2. problems
3. improvements
Traditional approach to course planning

1. purposes
2. problems
3. improvements

- course content
- assessment
Traditional approach to course planning

course determined by content

course
content

assessment

1 purposes 2 problems 3 improvements
Backward design

1 purposes
2 problems
3 improvements

desired outcomes
Backward design

1. purposes
2. problems
3. improvements

acceptable evidence → desired outcomes
Backward design

1. purposes
2. problems
3. improvements

- instructional approach
- acceptable evidence
- desired outcomes
Backward design

1. purposes
2. problems
3. improvements

course defined by outcomes

- instructional approach
- acceptable evidence
- desired outcomes
Backward design

1. purposes
2. problems
3. improvements

course defined by outcomes

instructional approach

acceptable evidence

desired outcomes
resolve coach/judge conflict
use external evaluators
peer- and self-assessment

1. purposes
2. problems
3. improvements
Calibrated Peer Review

cpr.molsci.ucla.edu

1 purposes
2 problems
3 improvements
rethink assessment
For a copy of these slides:

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