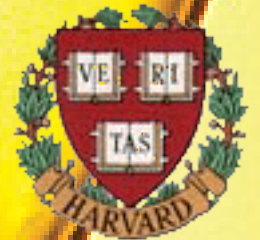


Educating the innovators of the 21st century



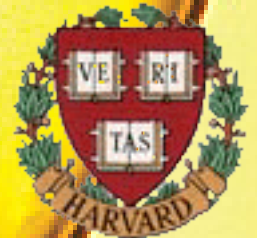
Lucia Mar Unified School District
Arroyo Grande, CA, 18 August 2013





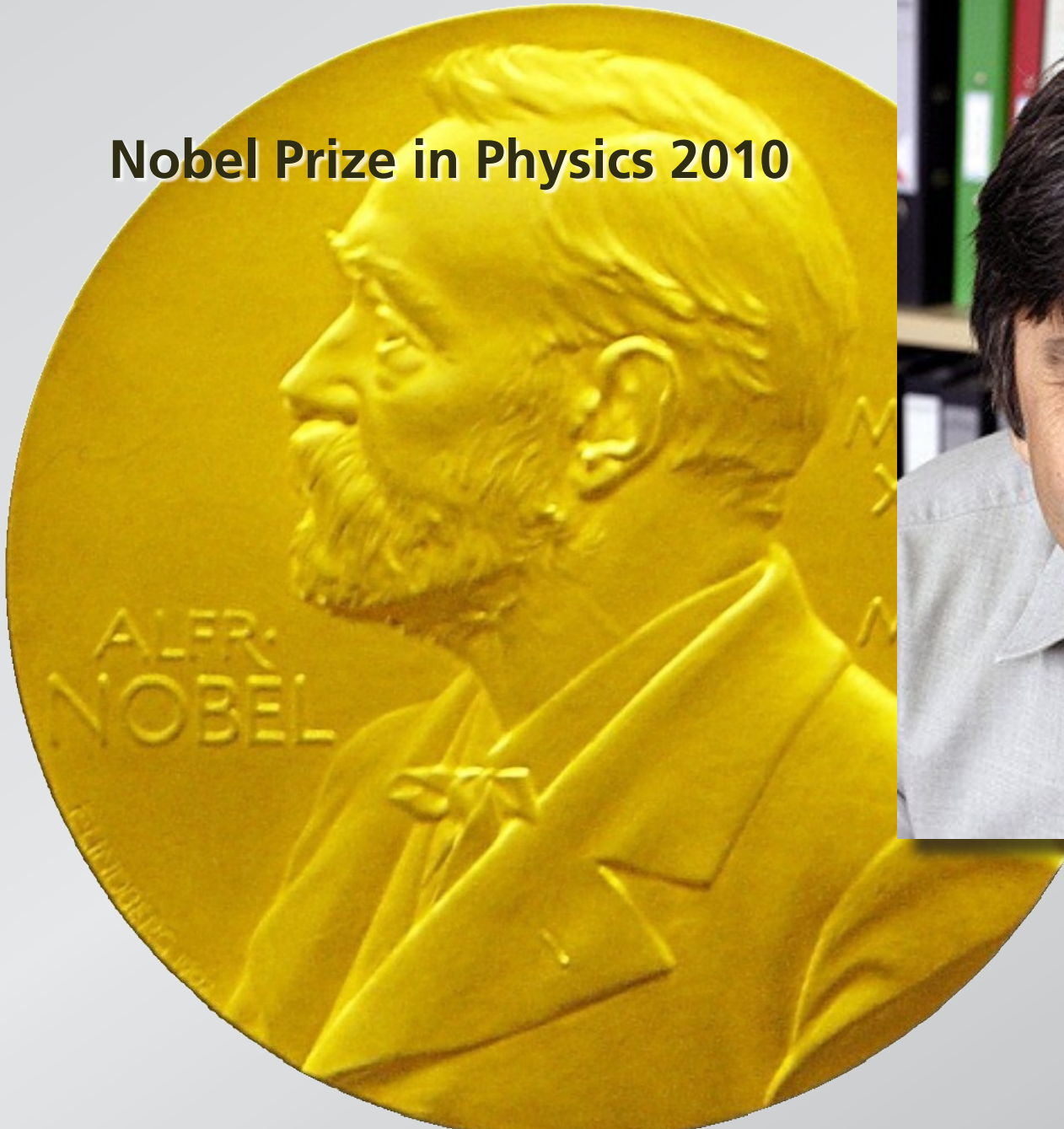
@eric_mazur

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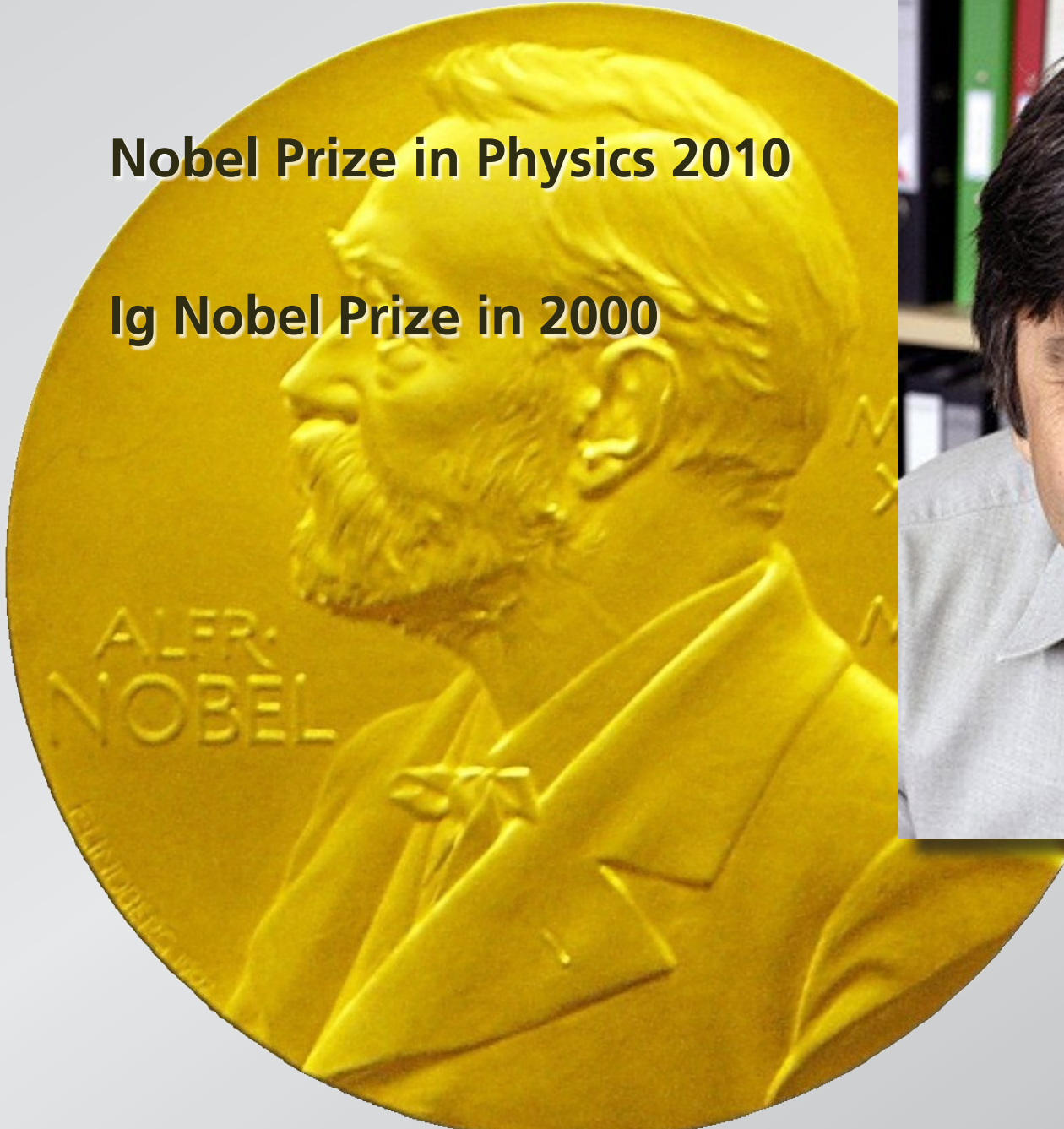
Innovation

Nobel Prize in Physics 2010

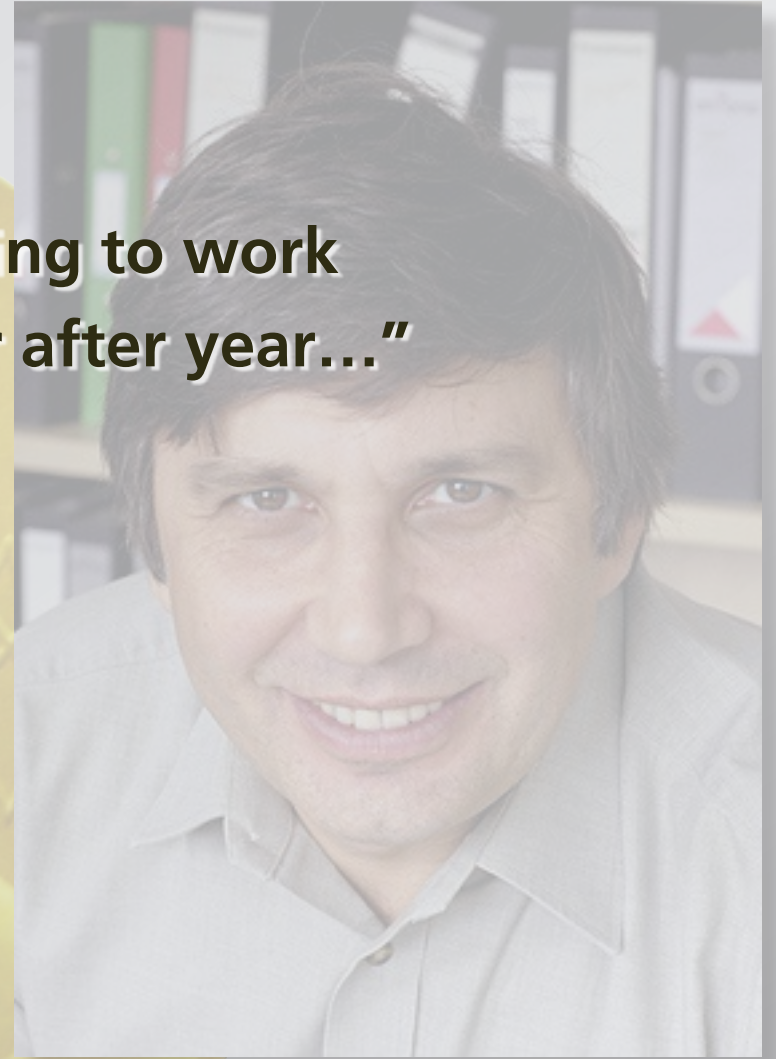


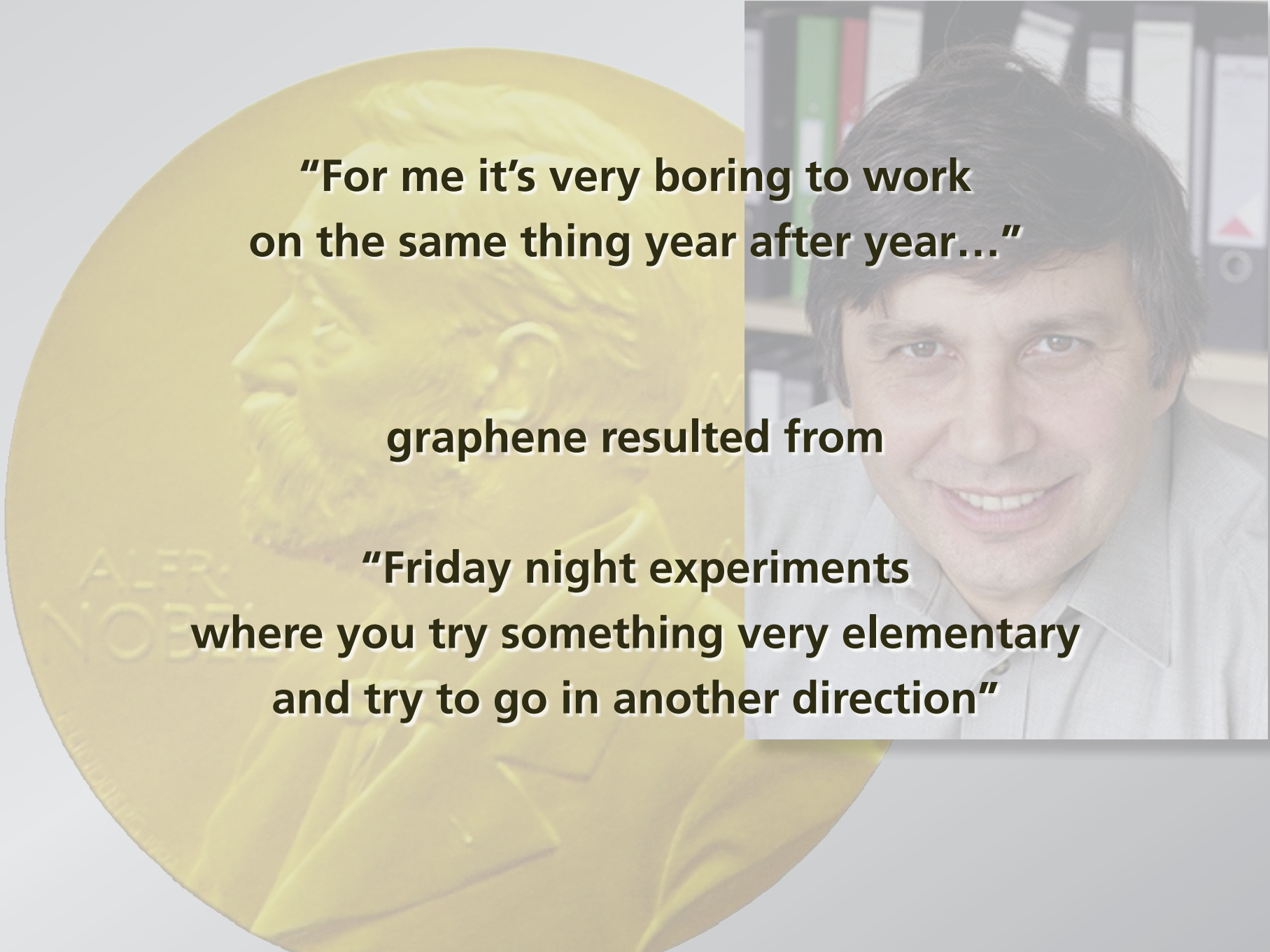
Nobel Prize in Physics 2010

Ig Nobel Prize in 2000



**“For me it’s very boring to work
on the same thing year after year...”**





**“For me it’s very boring to work
on the same thing year after year...”**

graphene resulted from

**“Friday night experiments
where you try something very elementary
and try to go in another direction”**


A glowing lightbulb with a warm yellow light emanating from it. The bulb is centered in the frame, and its glow fills the background. The text "how can we foster/teach innovation?" is superimposed on the lower half of the bulb.

how can we foster/teach innovation?



Need to...

- **teach *problem* solving**
- **encourage risk taking**



**What happens
in a lecture?**

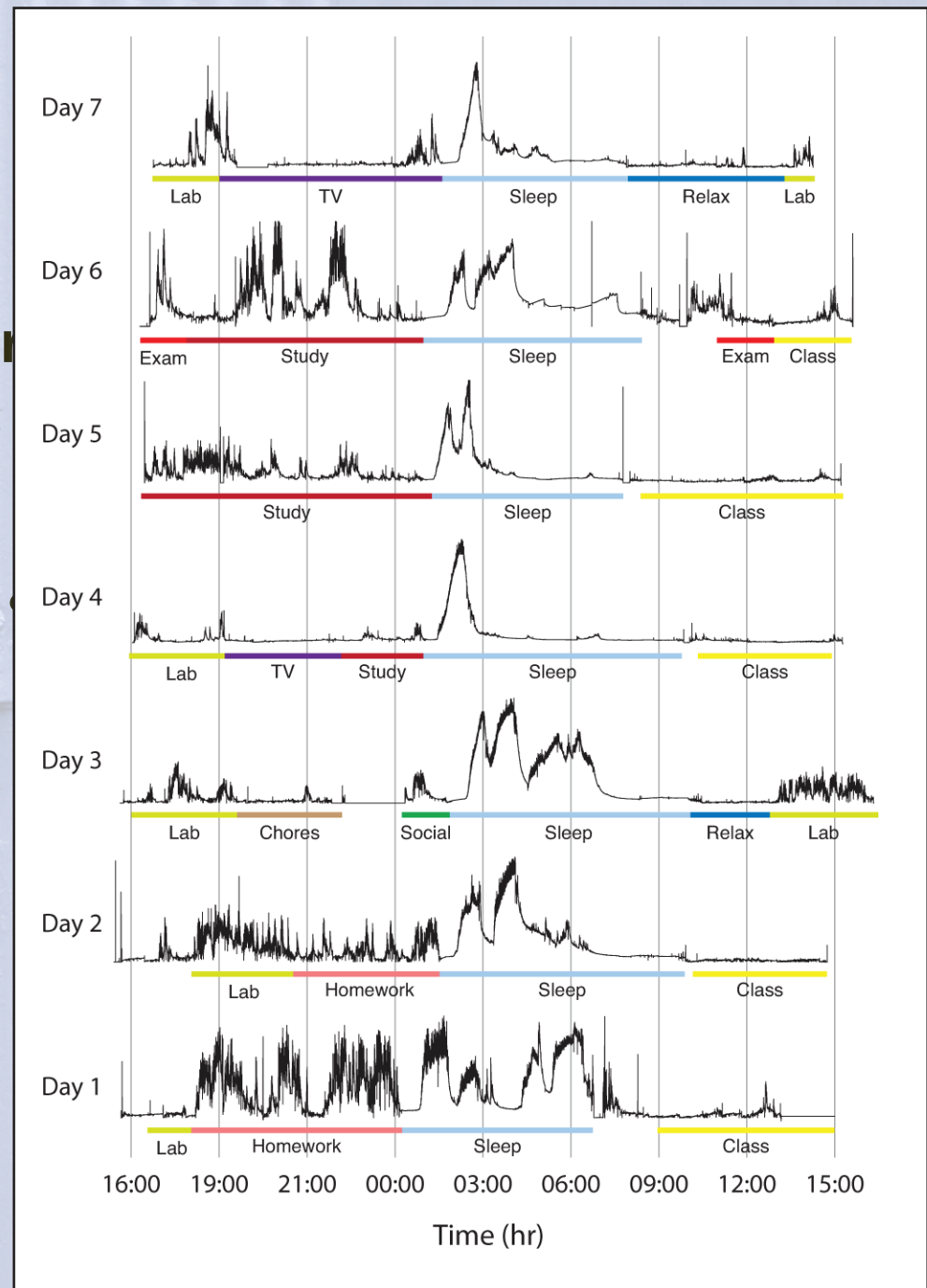
in a lecture, students...

in a lecture, students...

1. don't pay utmost attention

in a lecture

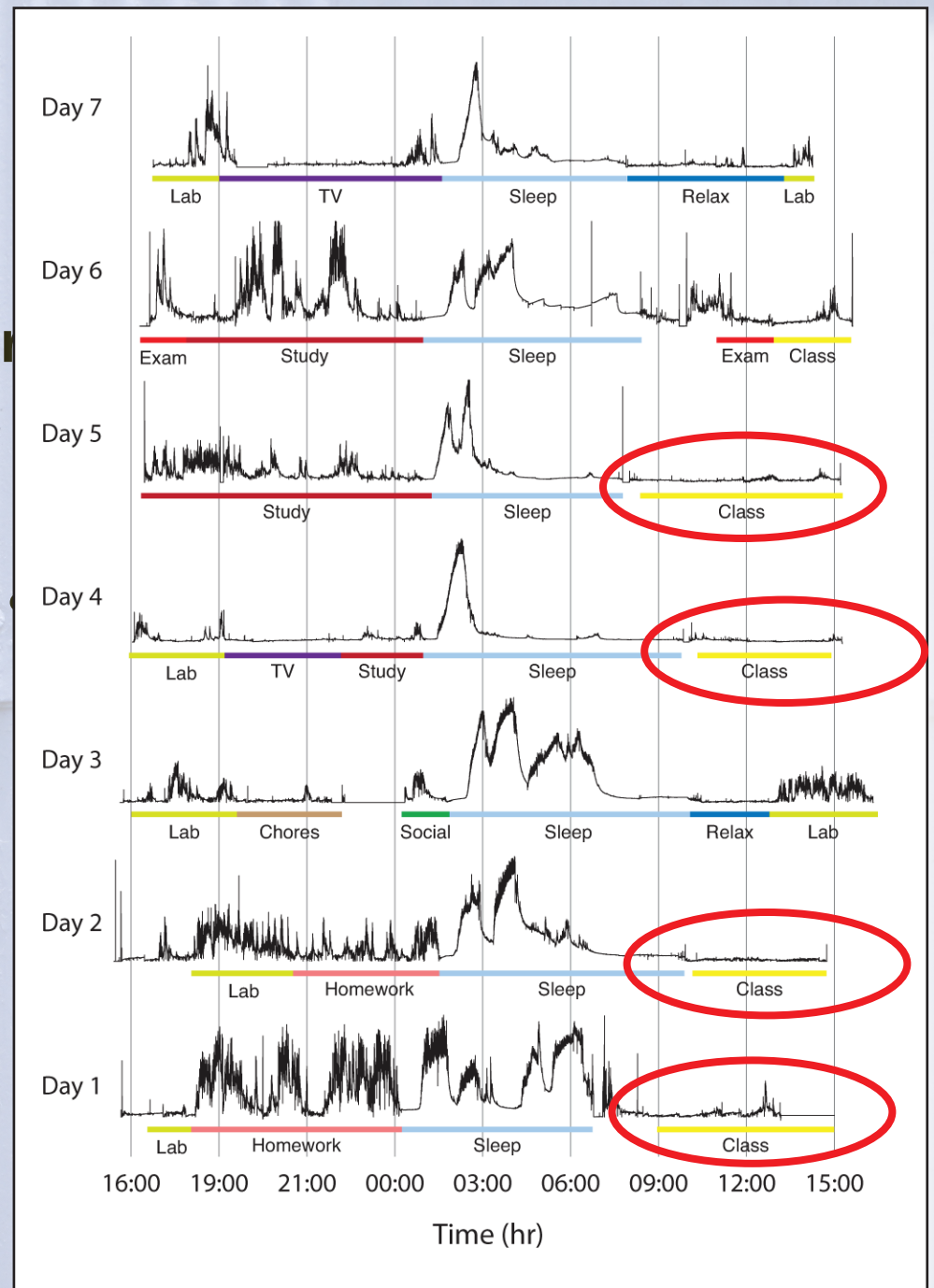
1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

in a lecture

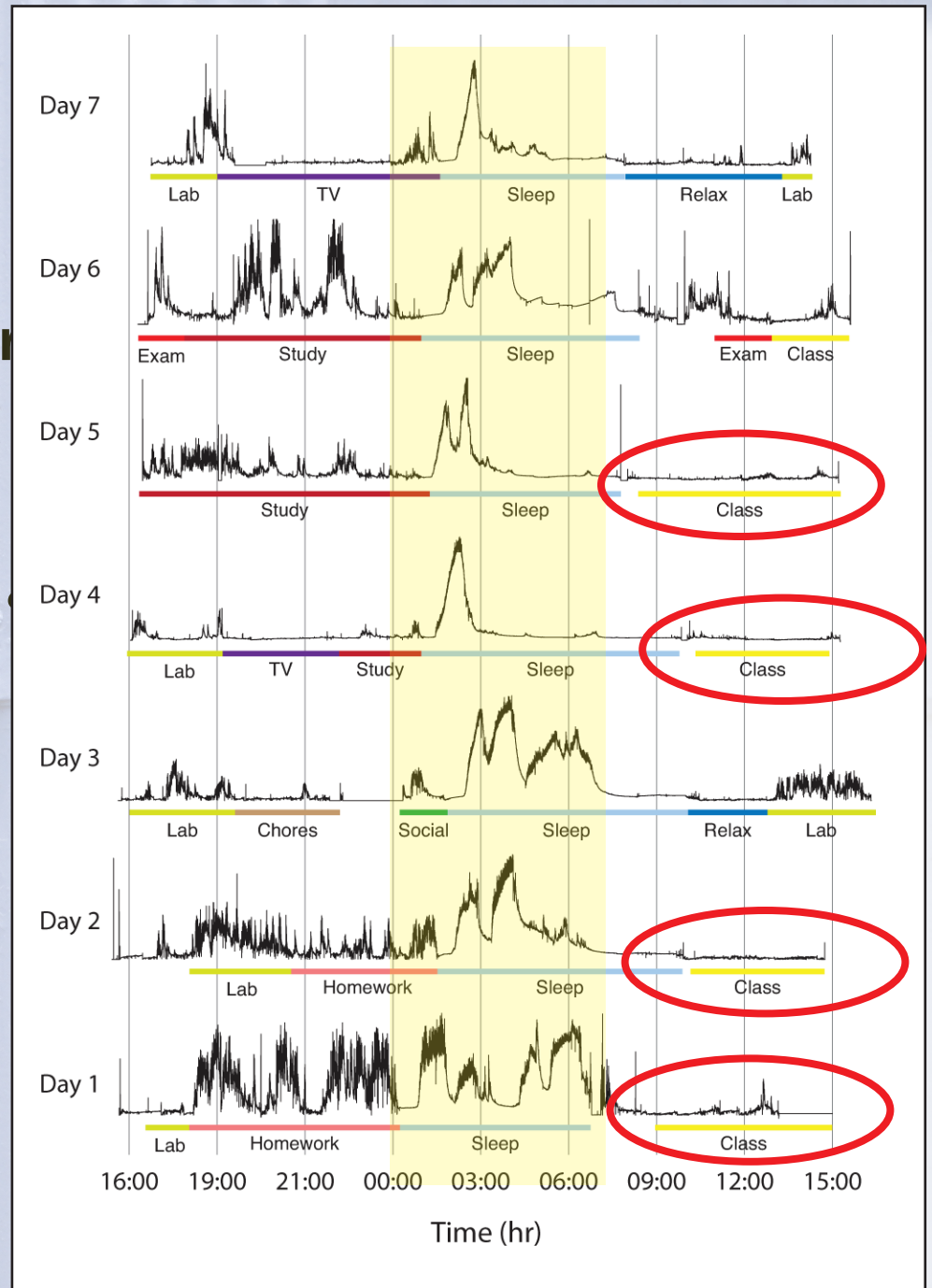
1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

in a lecture

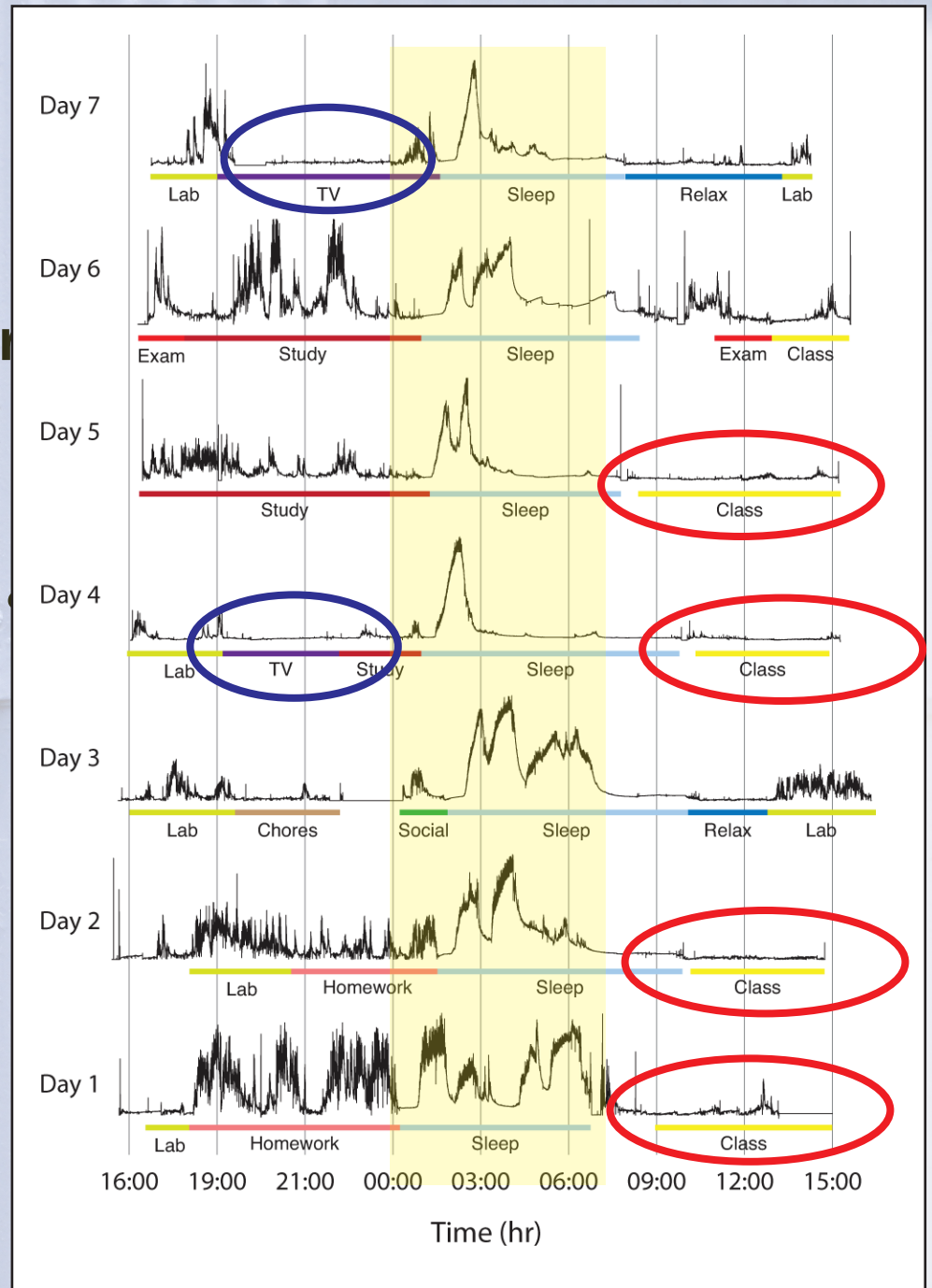
1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

in a lecture, students...

- 1. don't pay utmost attention**
- 2. think they know it**

in a lecture, students...

- 1. don't pay utmost attention**
- 2. think they know it**
- 3. are not confronted with misconceptions**

in a lecture, students...

1. don't pay utmost attention

2. think they know it

3. are not confronted with misconceptions

false
sense of security



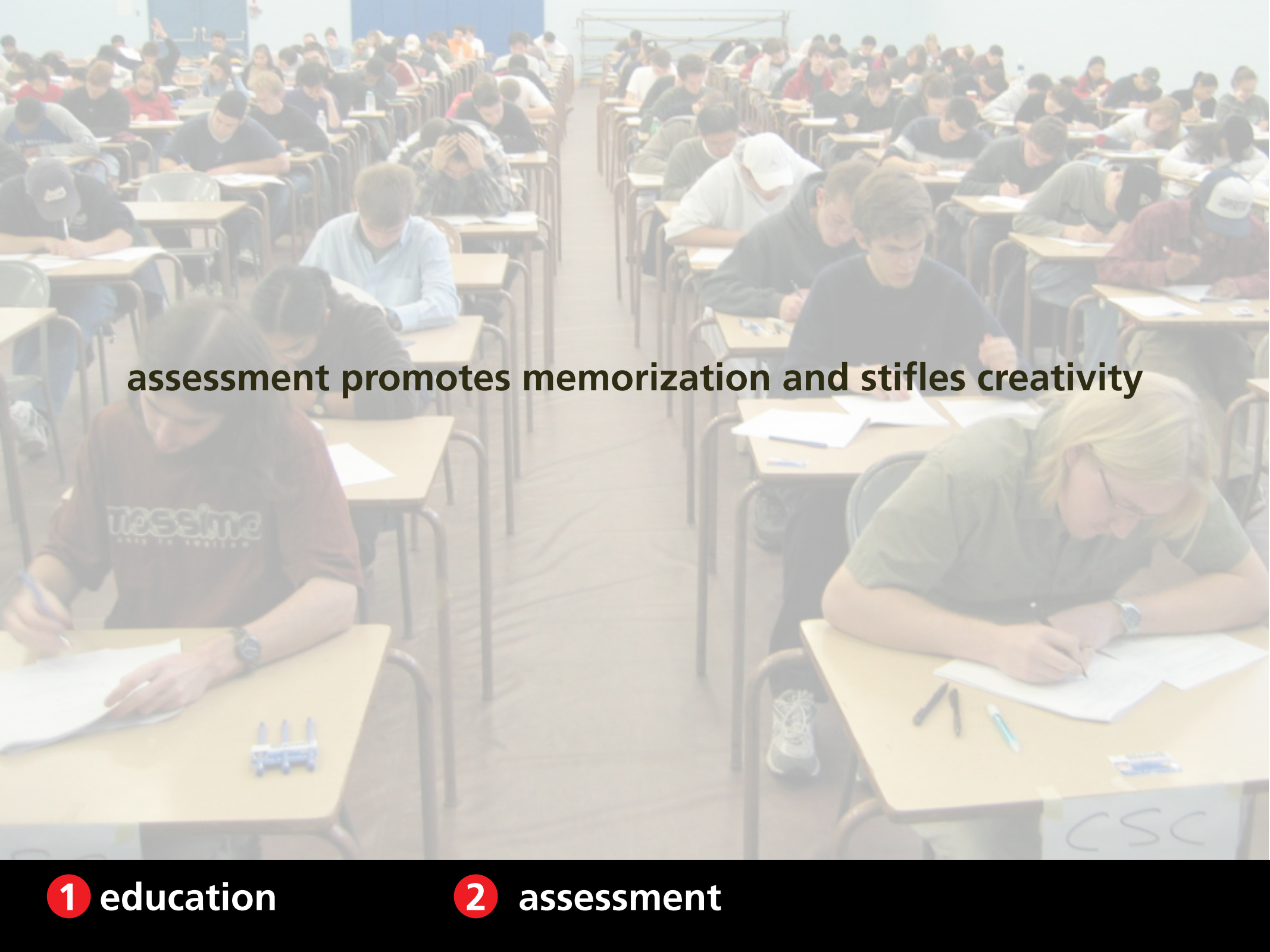
The background is a painting of a face with three eyes. The top and bottom eyes are open and looking forward, while the middle eye is closed. The face is rendered in a style that suggests a classical or religious figure. The text 'an illusion...' is written in a bold, red, serif font across the center of the face.

an illusion. . .



1 education

2 assessment



assessment promotes memorization and stifles creativity

1 education

2 assessment



problem

1 education

2 assessment



problem

outcome

1 education

2 assessment

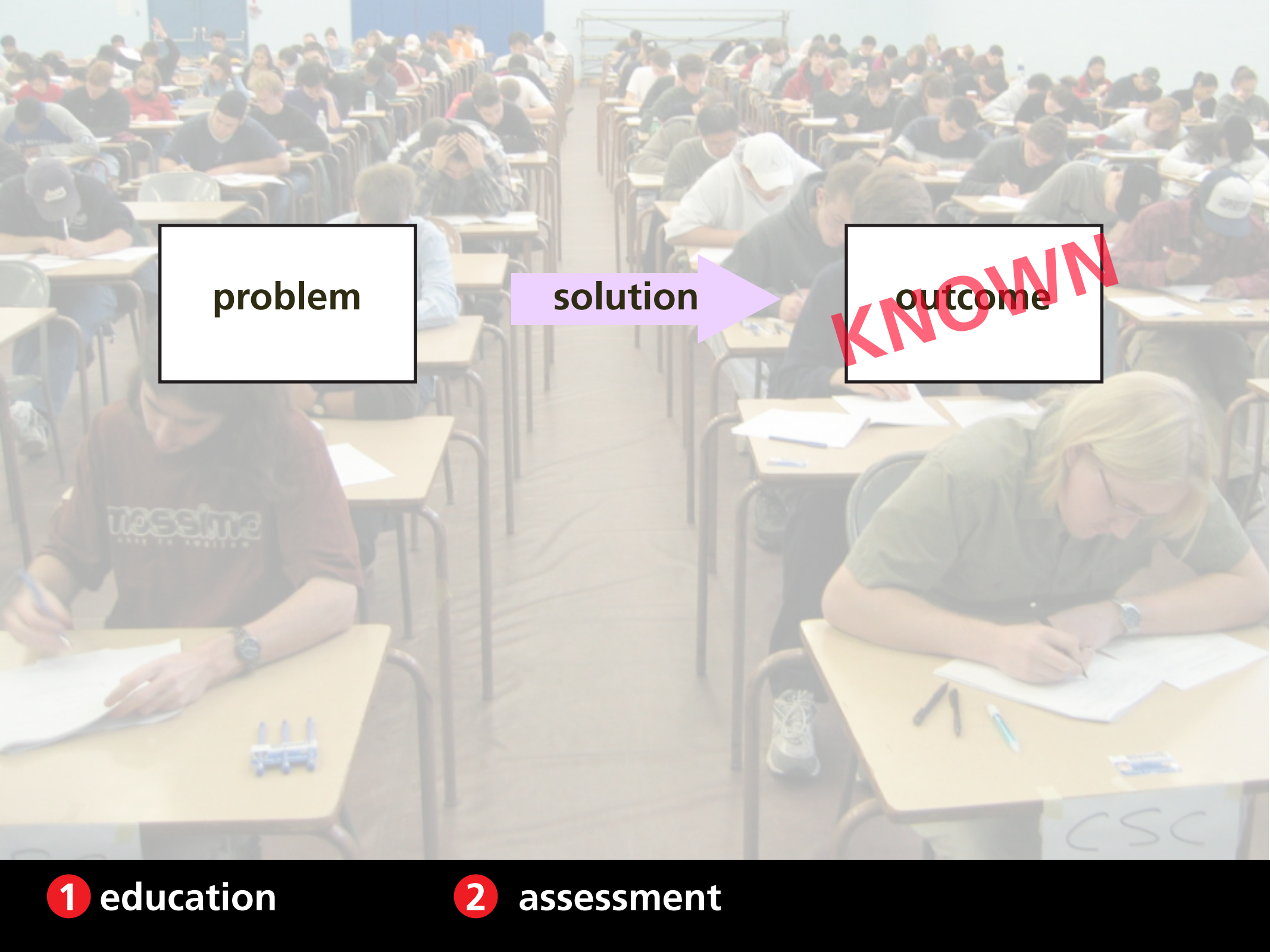
problem

solution

outcome

1 education

2 assessment



problem

solution →

outcome

KNOWN

1 education

2 assessment



problem

solution

outcome

UNKNOWN → **KNOWN**

1 education

2 assessment

problem

solution

outcome

UNKNOWN → **KNOWN**

problem

1 education

2 assessment

problem

solution

outcome

UNKNOWN

KNOWN

problem

procedure

1 education

2 assessment

problem

solution

outcome

UNKNOWN

problem

procedure

answer

1 education

2 assessment

problem

solution

outcome

UNKNOWN

problem

procedure

answer

KNOWN

1 education

2 assessment

problem

solution

outcome

UNKNOWN

problem

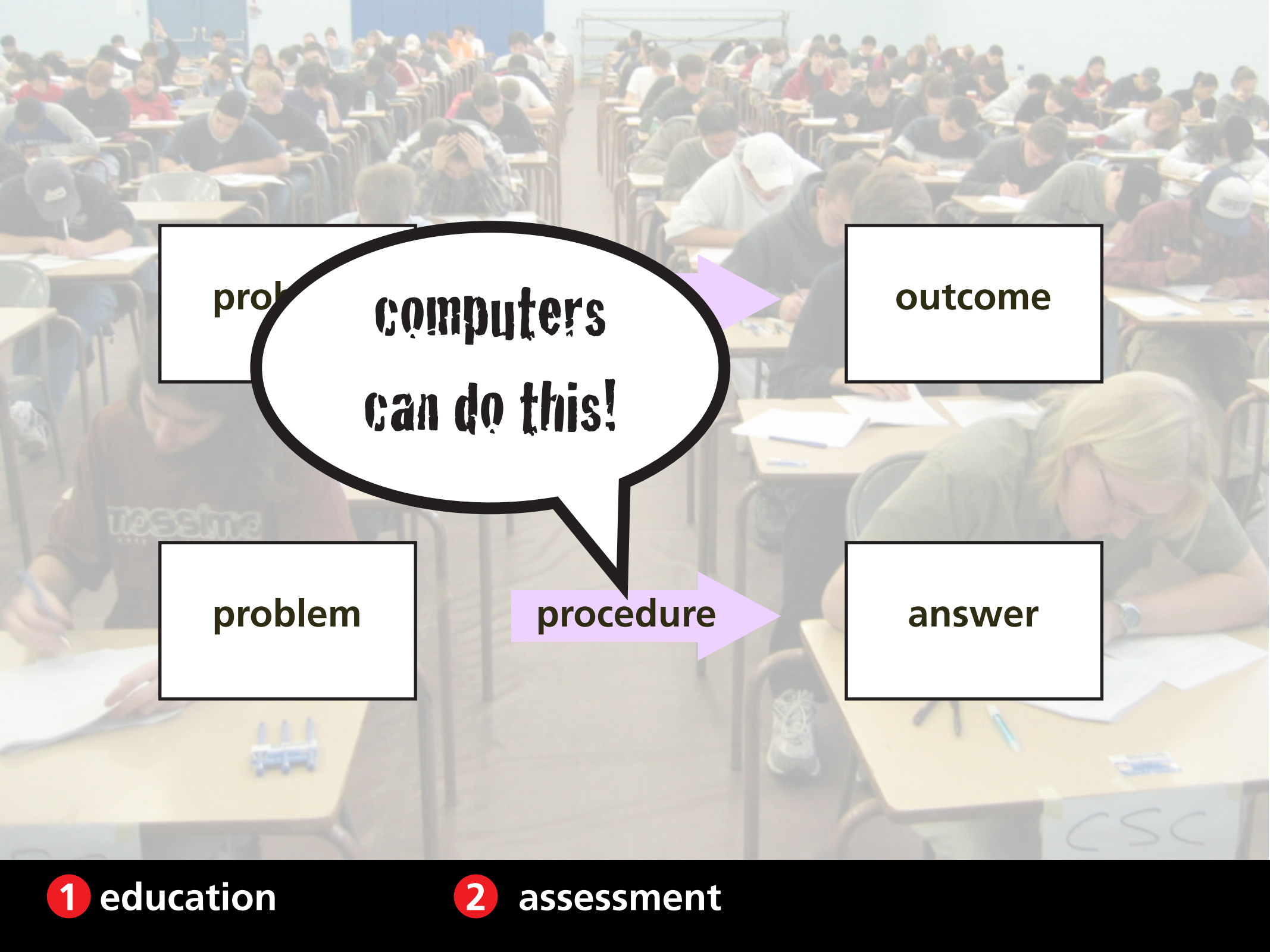
procedure

answer

KNOWN

1 education

2 assessment



problem

**computers
can do this!**

outcome

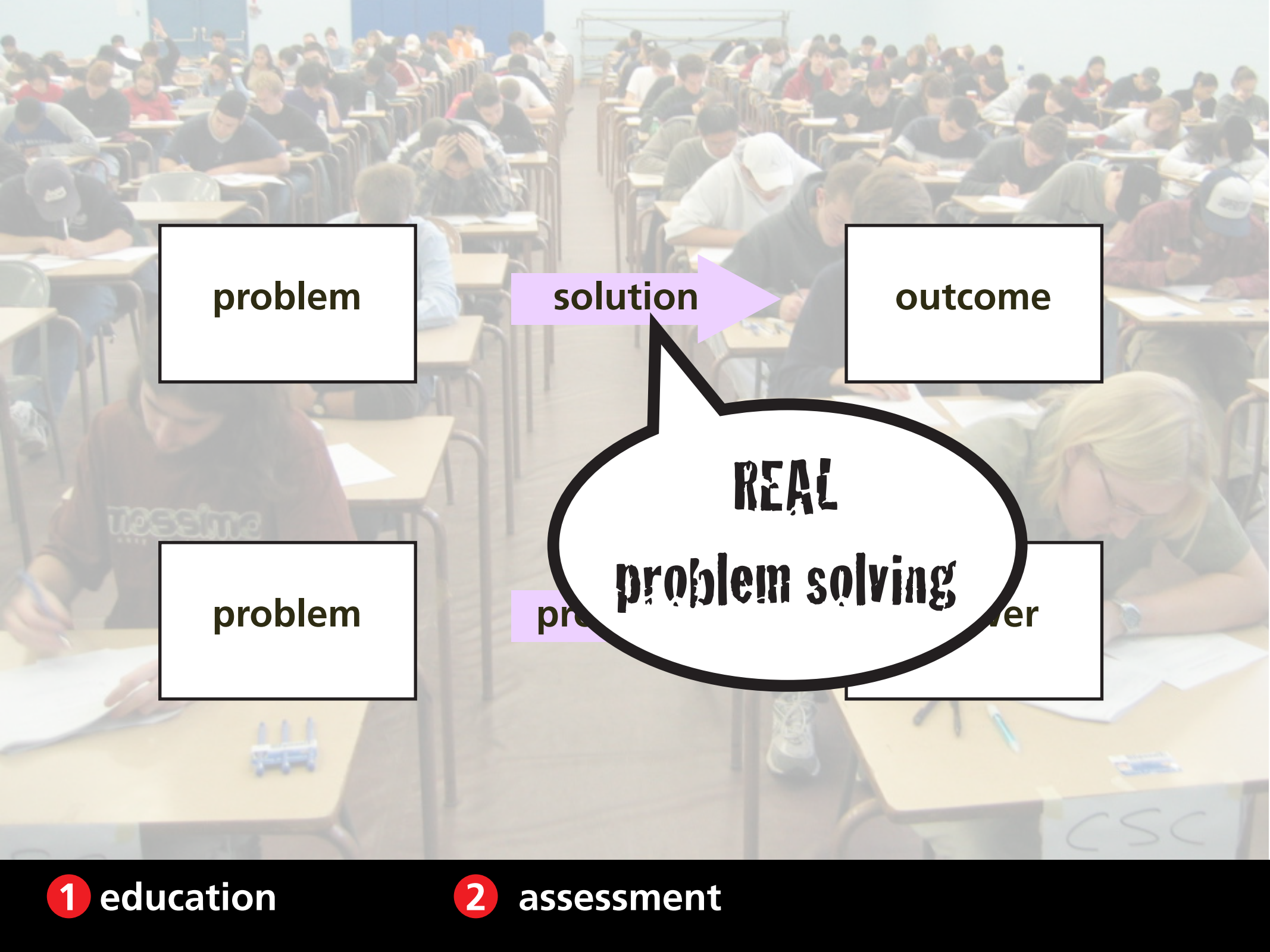
problem

procedure

answer

1 education

2 assessment



problem

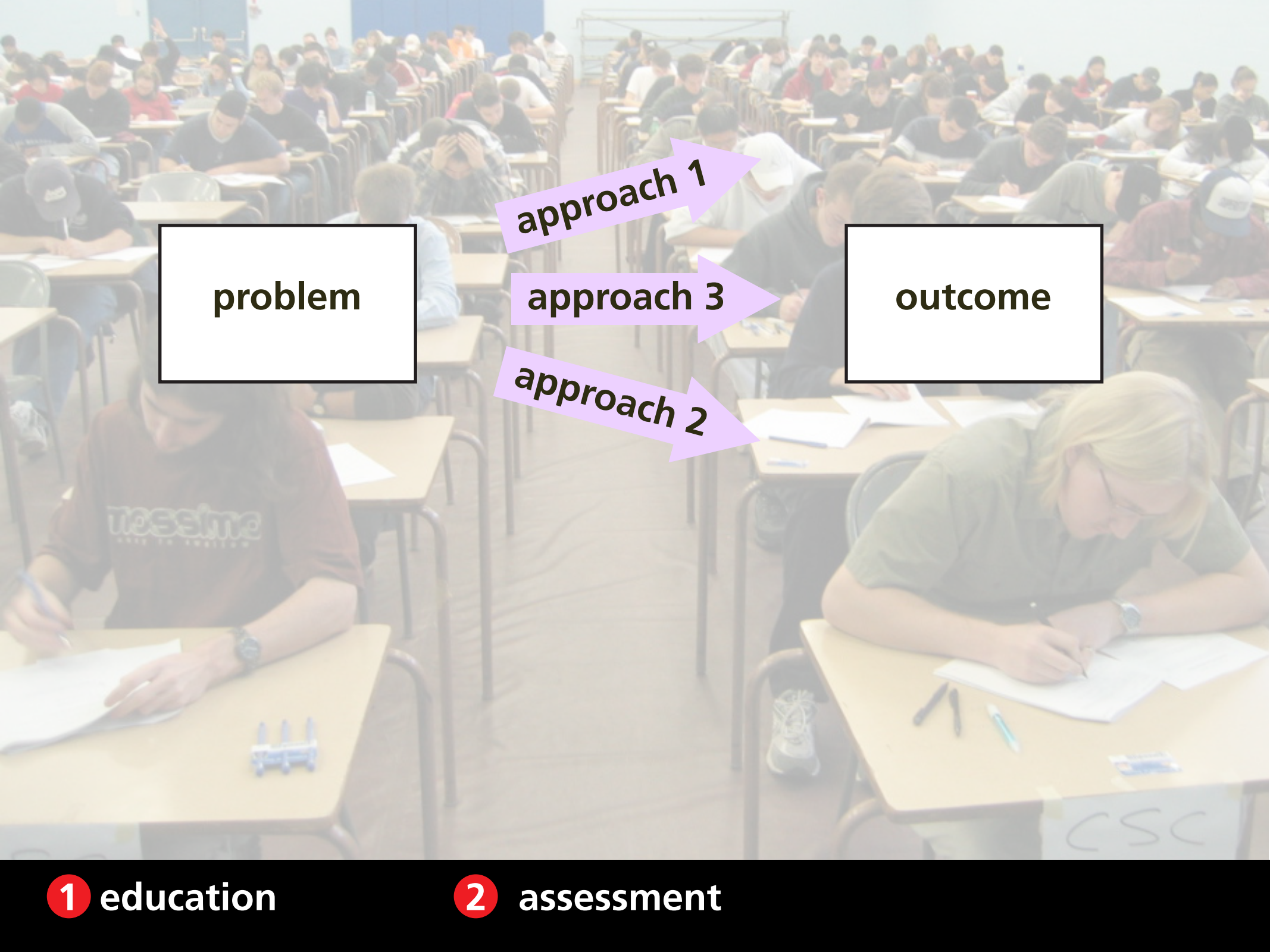
solution →

outcome

**REAL
problem solving**

problem

pre **er**



problem

approach 1

approach 3

approach 2

outcome

problem

approach 1

approach 3

approach 2

outcome

assessment incompatible with real problem solving

1 education

2 assessment



Traditional assesement

- focuses on outcome, not process



Traditional assessment

- focuses on outcome, not process
- discourages risk taking



Traditional assesement

- focuses on outcome, not process
- discourages risk taking
- focuses on individual, not group



Traditional assesement

- **focuses on outcome, not process**
- **discourages risk taking**
- **focuses on individual, not group**
- **does not mirror future work environment**

Funding:

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