Applied Physics

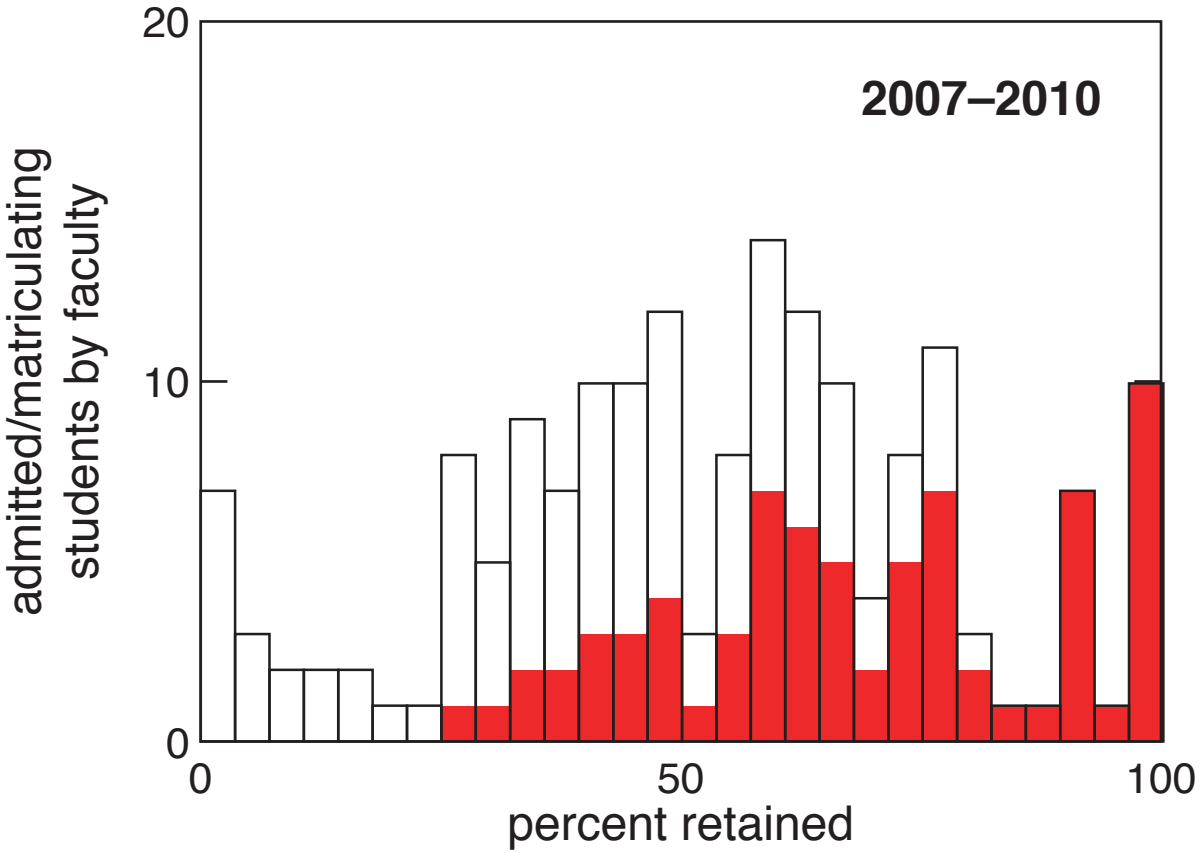
SEAS Retreat
Boston, MA, 16 December 2011

Applied Physics

Community building

Applied Physics

a serious problem…



Graduate Student Council

Graduate student involvement:

- Colloquium
- Big brother/sister program
- Social events
- Other activities

Graduate Student Council

Social events for graduate students

- BB/BS welcome event at Tommy Doyles
- Fall AP social
- “Dinner with strangers” at John Harvard’s
- Spring BB/BS event
- Year-end pizza with G1s

Graduate Student Council

Connecting with faculty

- Post colloquium social hour in Queens Head Pub
- Applied Physics Fest

Graduate Student Council

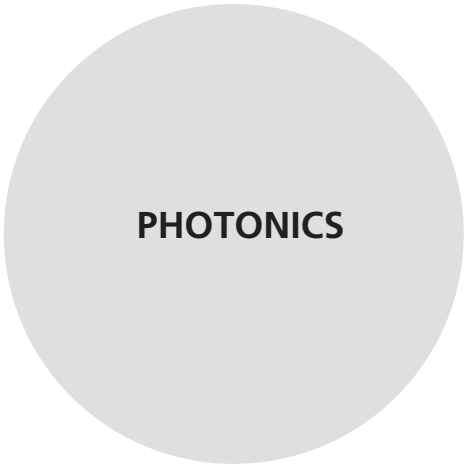
Other activities

- T-shirt contest
- Journal club

Faculty Lunches

- Curriculum
- Searches

Faculty Lunches



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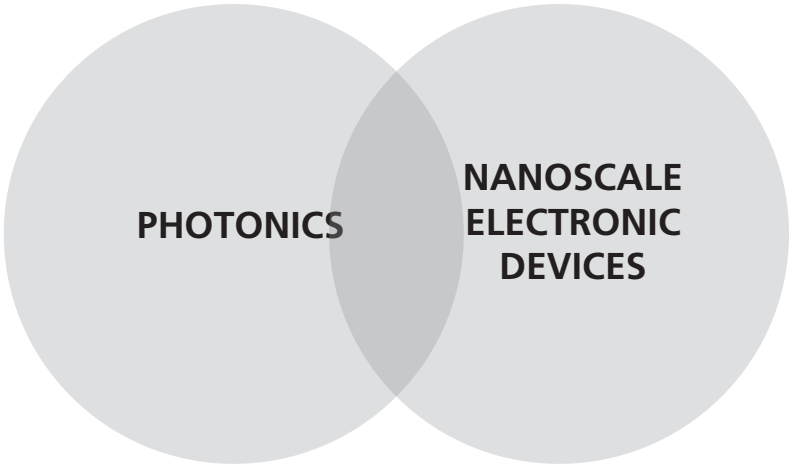

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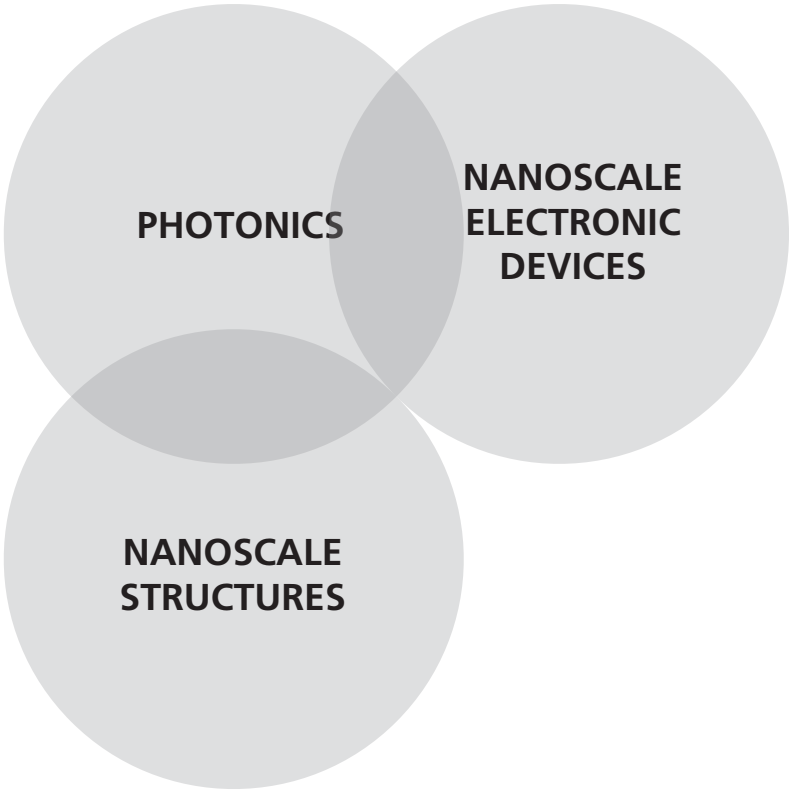

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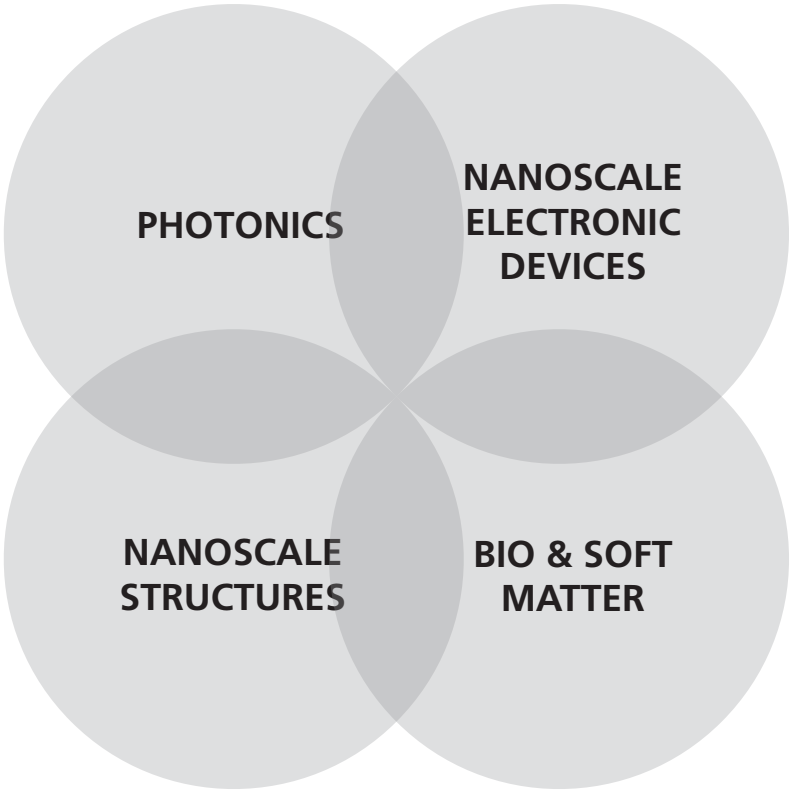

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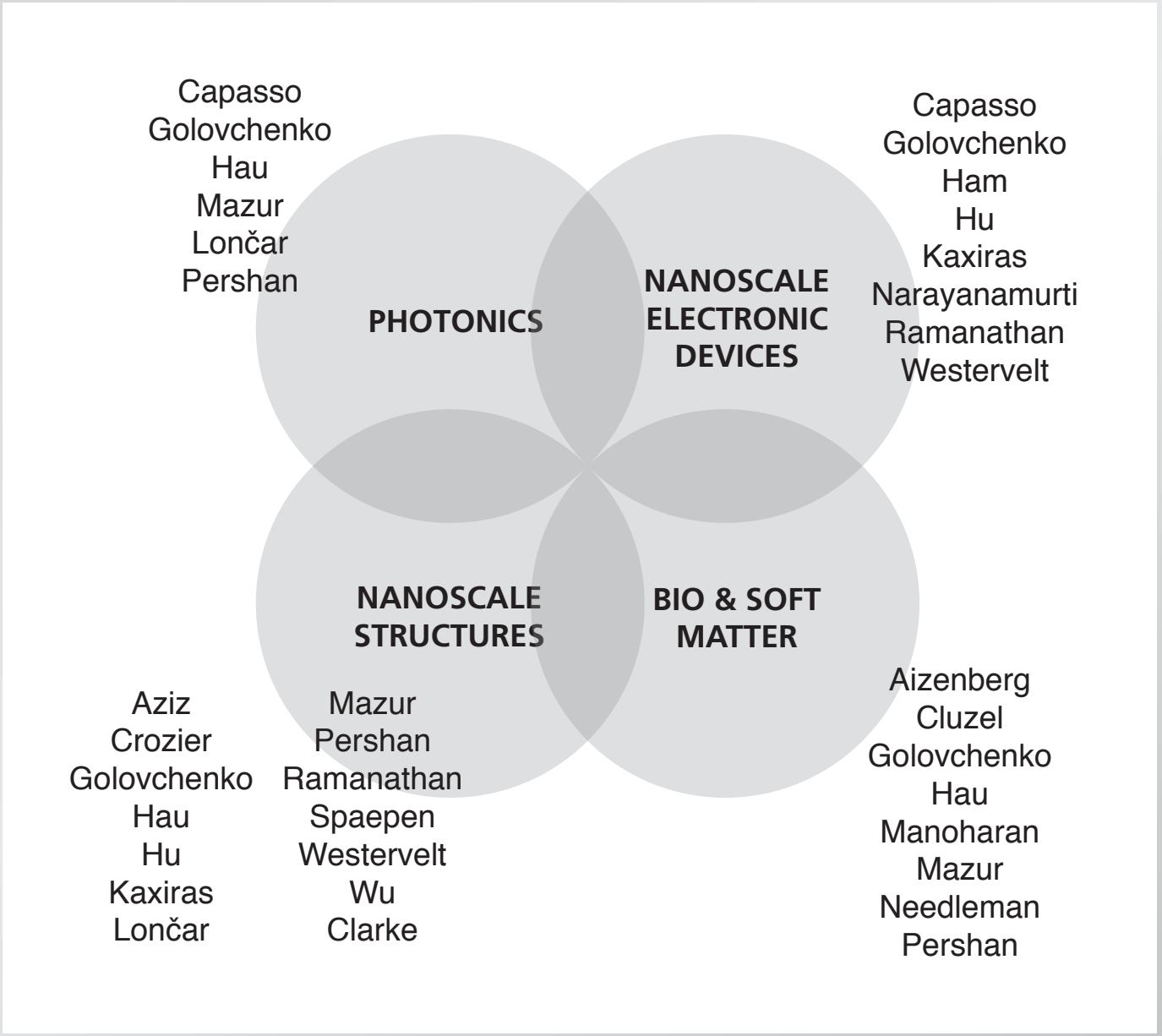


Faculty Lunches

APPLIED PHYSICS MODEL PROGRAMS

The Applied Physics Ph.D. program comprises four areas of research: Photonics, Nanoscale Electronic Devices, Nanoscale Structures, and Biological and Soft Matter Physics. The model programs for each of these areas consists of a number of *core courses* (defining the area), *fundamental courses* (basic physics knowledge required), and *elective courses*.

A total of 10 courses are required to fulfill the course requirements for a Ph.D. in Applied Physics. Only two courses below the 200 level may be included. Students who need additional 100-level courses may take more than 10 courses. For students whose thesis research does not involve any experimental work, at least one course must involve performing experiments (*e.g.*, an experimental 299r).

Please note that these programs serve as *models* only. The final program final curriculum should be determined in consultation with your advisor.

PHOTONICS

Photonics is a broad and diverse field at the crossroads of Electrical Engineering, Applied Physics and Physics. The central focus of the proposed PhD model program in Photonics is on core courses, which capture the main thrusts of this field, emphasizing the state-of-the-art of new discoveries in optical physics and photonics technology. These core courses require knowledge of fundamentals such as *Quantum Mechanics*, *Solid-state Physics* and *Electromagnetism*. A list of *electives* to provide additional breadth complements the program.

Associated Faculty

Federico Capasso

Jene Golovchenko

Lene Hau

Eric Mazur

Marko Loncar

Peter Pershan

Core Courses

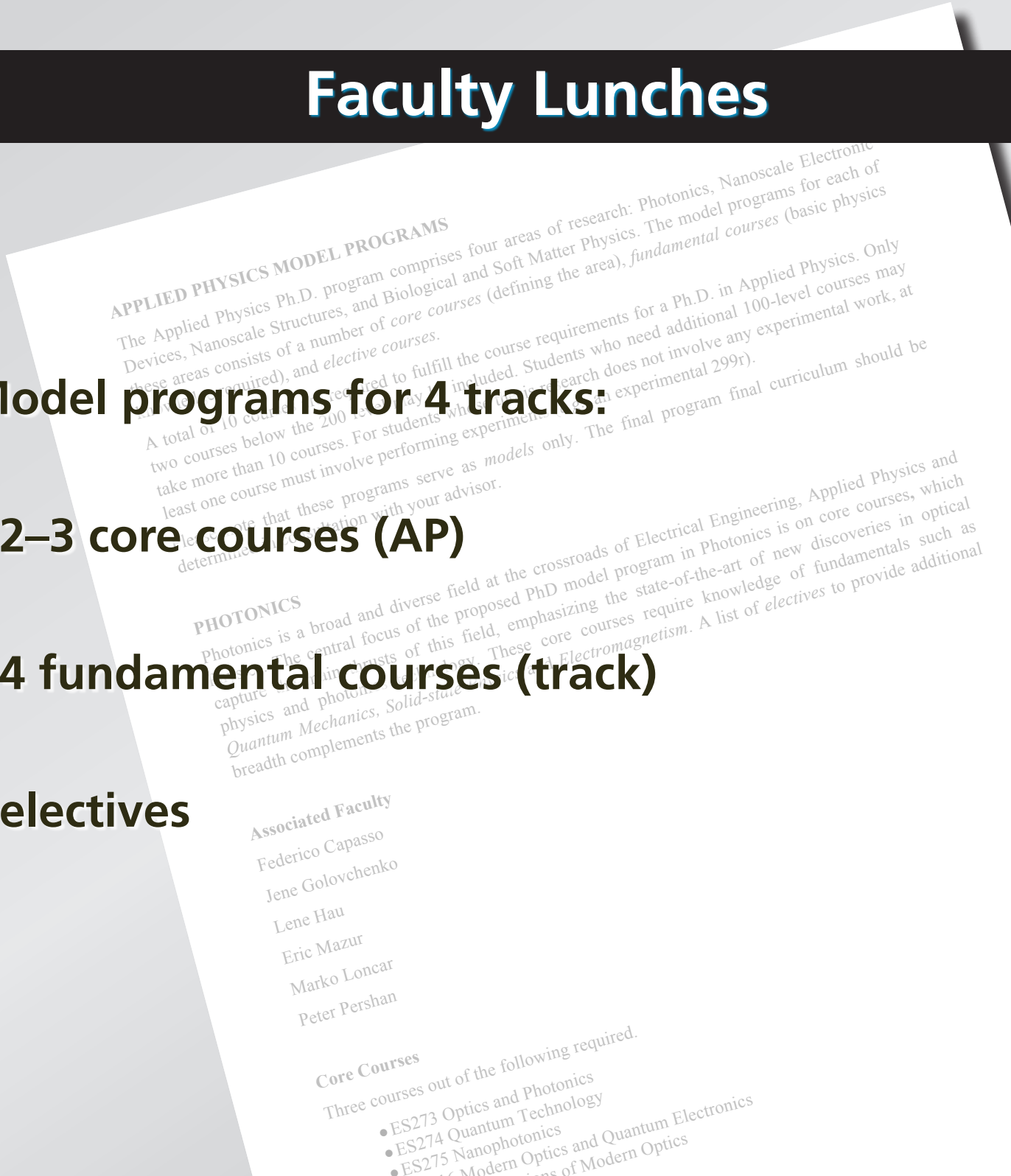
Three courses out of the following required.

- ES273 Optics and Photonics
- ES274 Quantum Technology
- ES275 Nanophotonics
- [illegible] Modern Optics and Quantum Electronics
- [illegible]ns of Modern Optics

Faculty Lunches

Model programs for 4 tracks:

- 2–3 core courses (AP)
- 4 fundamental courses (track)
- electives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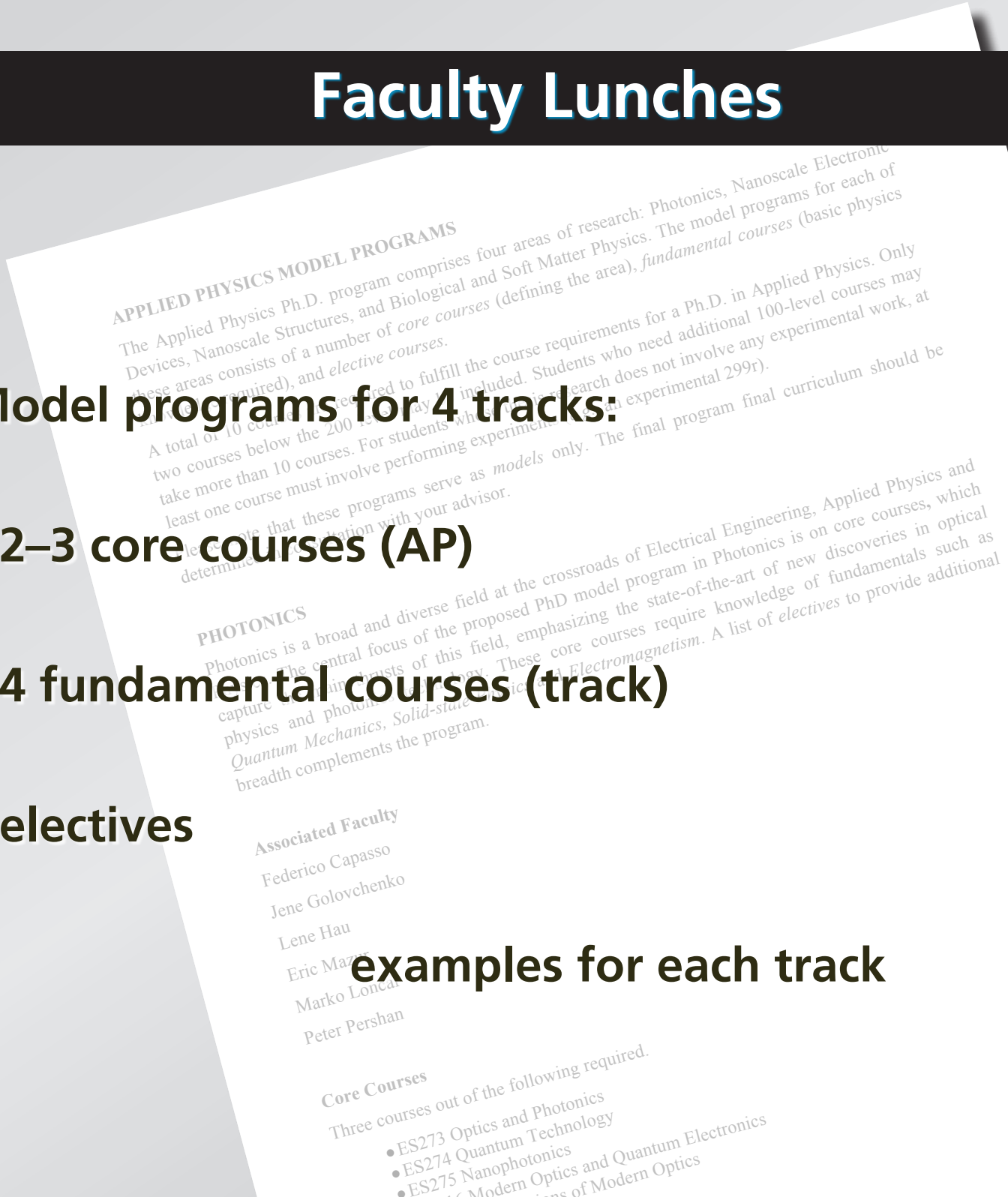
examples for each track



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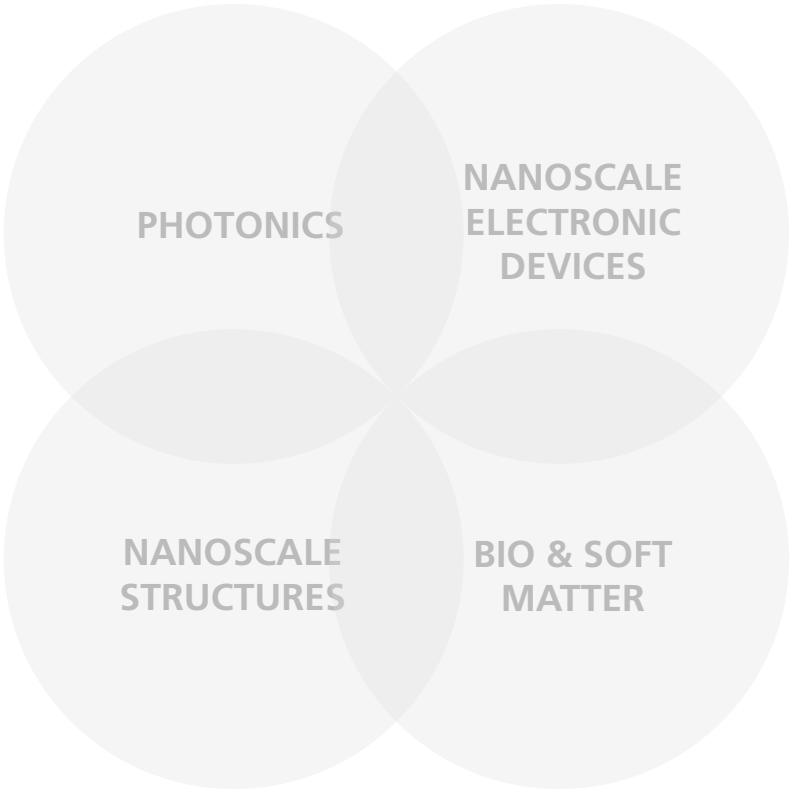

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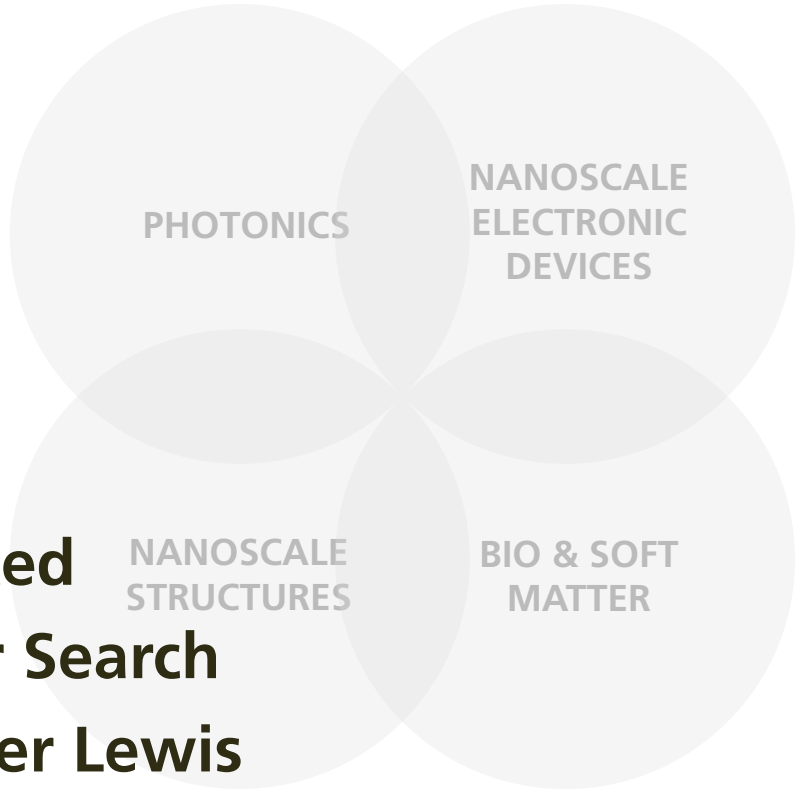


Targeted

Senior Search

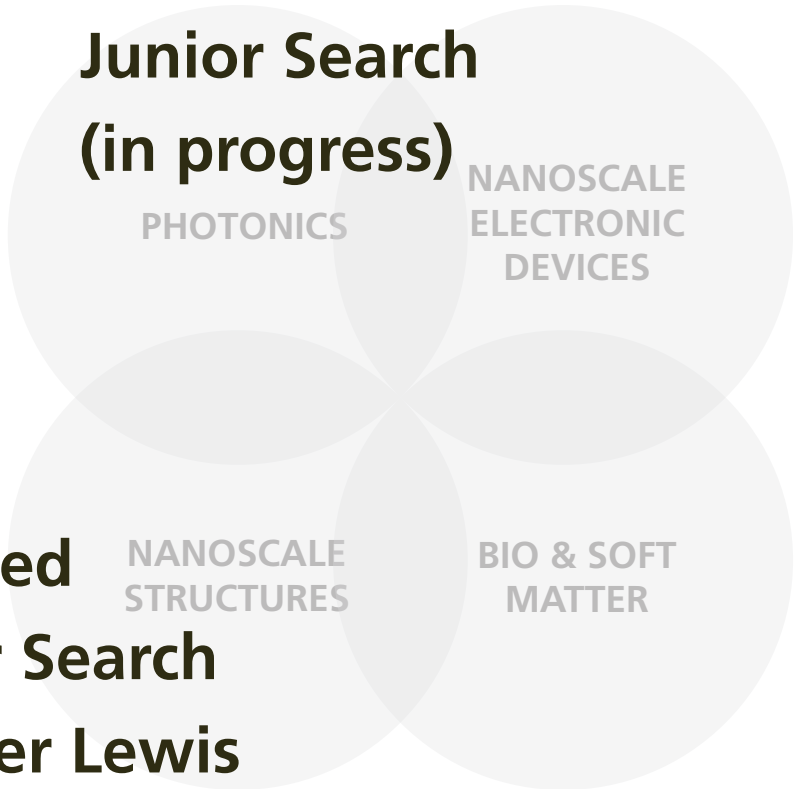
Jennifer Lewis

Faculty Lunches

Broad

Junior Search

(in progress)



Targeted

Senior Search

Jennifer Lewis

Community building

- AP Physics Fest
- Social Hour in Queen's Head Pub

Community building

- AP Physics Fest
- Social Hour in Queen's Head Pub
- "Take a colleague to lunch" program
- Collaborative grants

Plans

- Curriculum review
- Teaching week
- AP Student survey
- AP50

Curriculum review

- Learning goals for tracks
- Course assesment: Review syllabi, reduce redundancy
- Define core AP program?

Curriculum review

Core AP program:

- Unites AP graduate students
- Maximizes their flexibility
- Qualifying exam consistency?

Curriculum review

	photonics	nanoelectronic devices	nanostructures	bio & soft matter
Stat Mech		✔	✔	✔
E&M	✔	✔	✔	✔
Quantum Mech	✔	✔	✔	
Solid State	✔			

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Solid State	✔	✔		✔	
Fluid Mech	✔		✔	✔	

Curriculum review

Must keep in mind:

- **Potential benefits to students**
- **Flexibility of program**

Curriculum review

Applied Physics 50

Intro Physics Courses

Four tracks, all modeled after standard course for majors

Intro Physics Courses

current approach doesn’t satisfy needs of SEAS students

Goals

- address engineering student needs

Goals

- address engineering student needs
- pull freshmen into science & engineering

Intro Physics courses

Need to:

- align goals to students' needs and expectations
- change the approach
- redesign the learning space

Seminar course

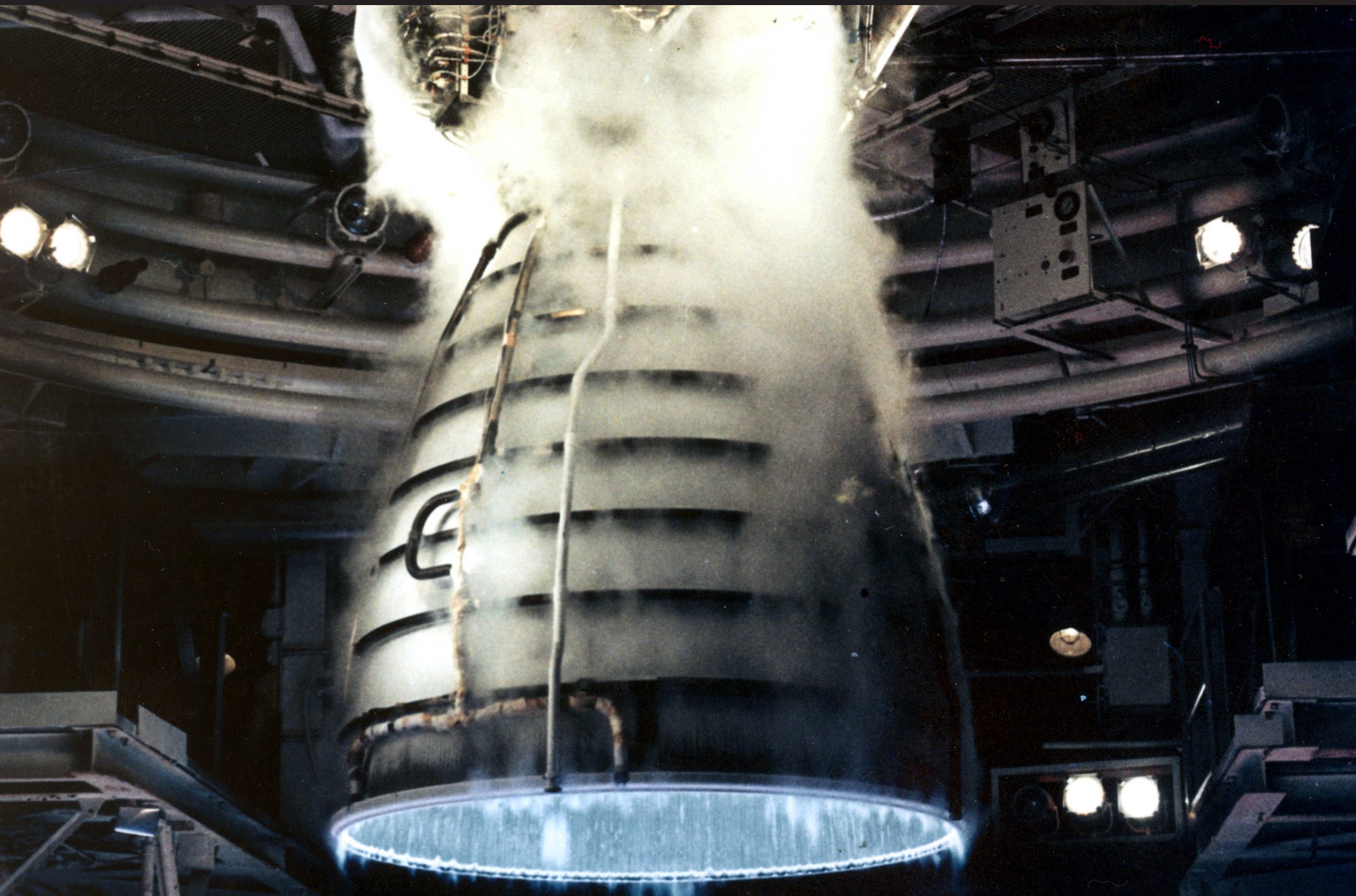
Applied Physics 50

students learn content through projects

Applied Physics 50

- two-semester course, six projects
- each project relates to a different engineering field
- opportunity to develop important skills

Mission to Mars



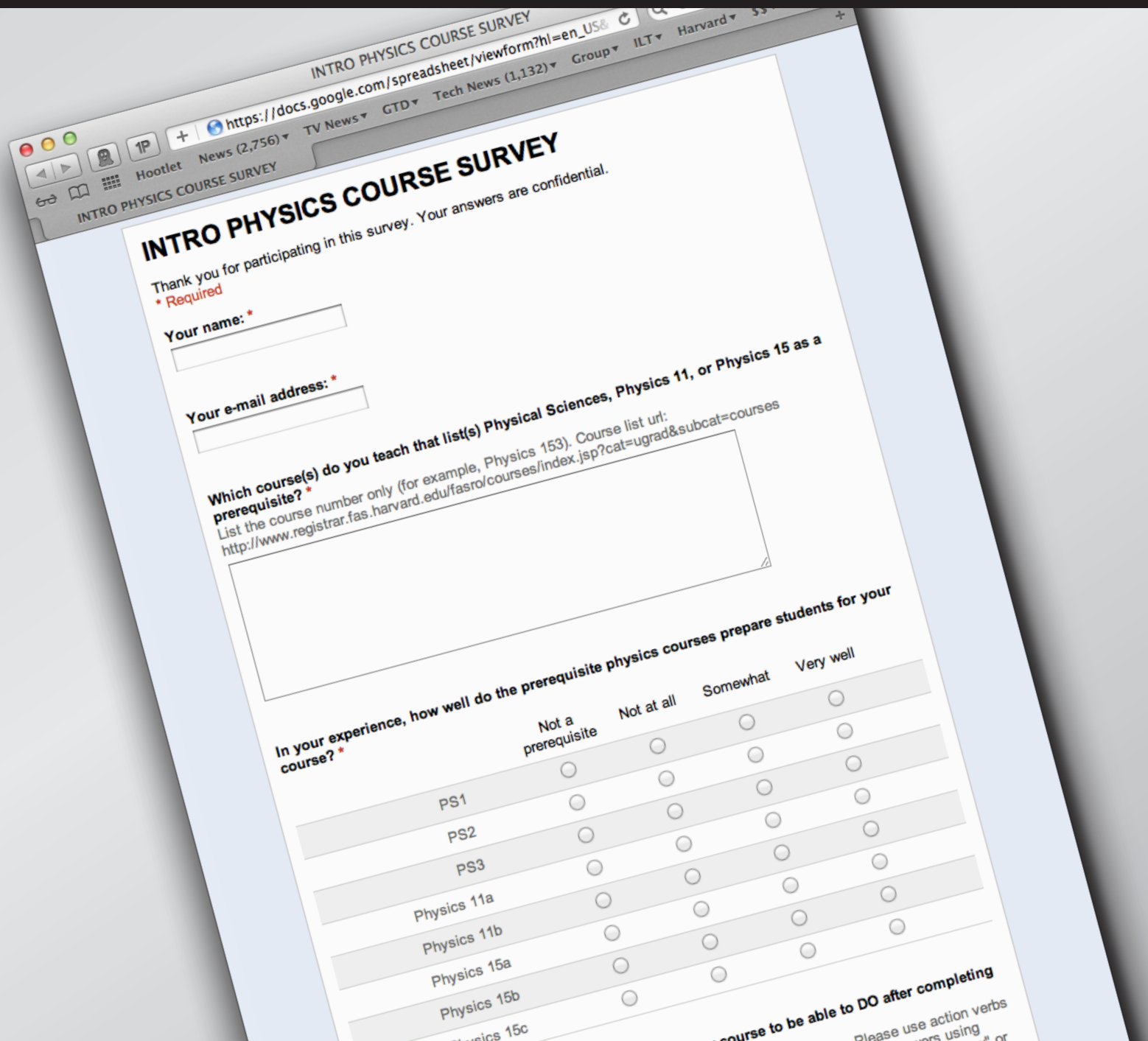
Mission to Mars

design and plan a manned or unmanned mission to Mars

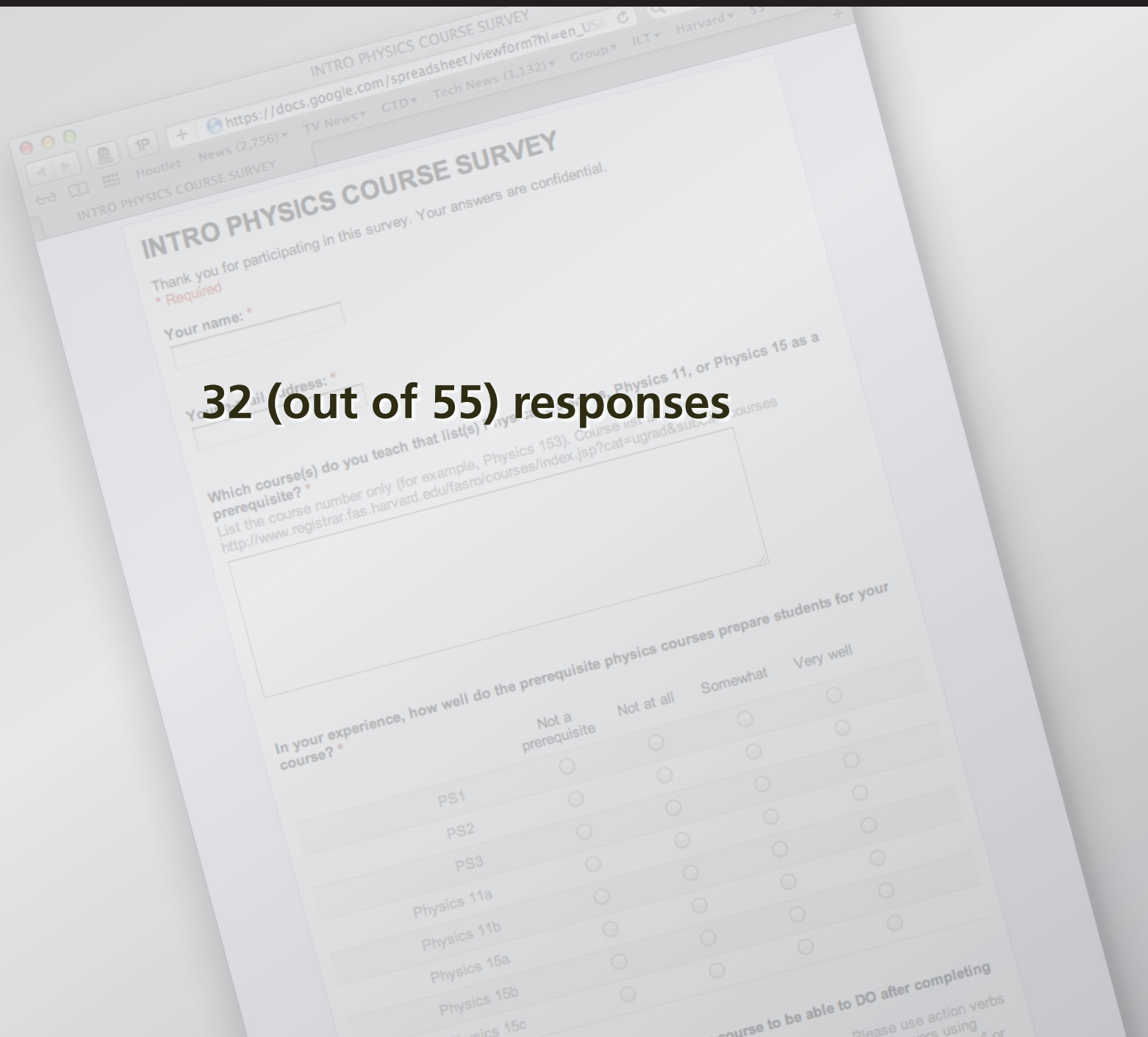
Course design

- Survey faculty for expectations
- Design Learning Goals (& think about assessment)
- Determine resources needed & assemble team
- Design projects
- Design project activities
- Develop Evaluation Process

Course design

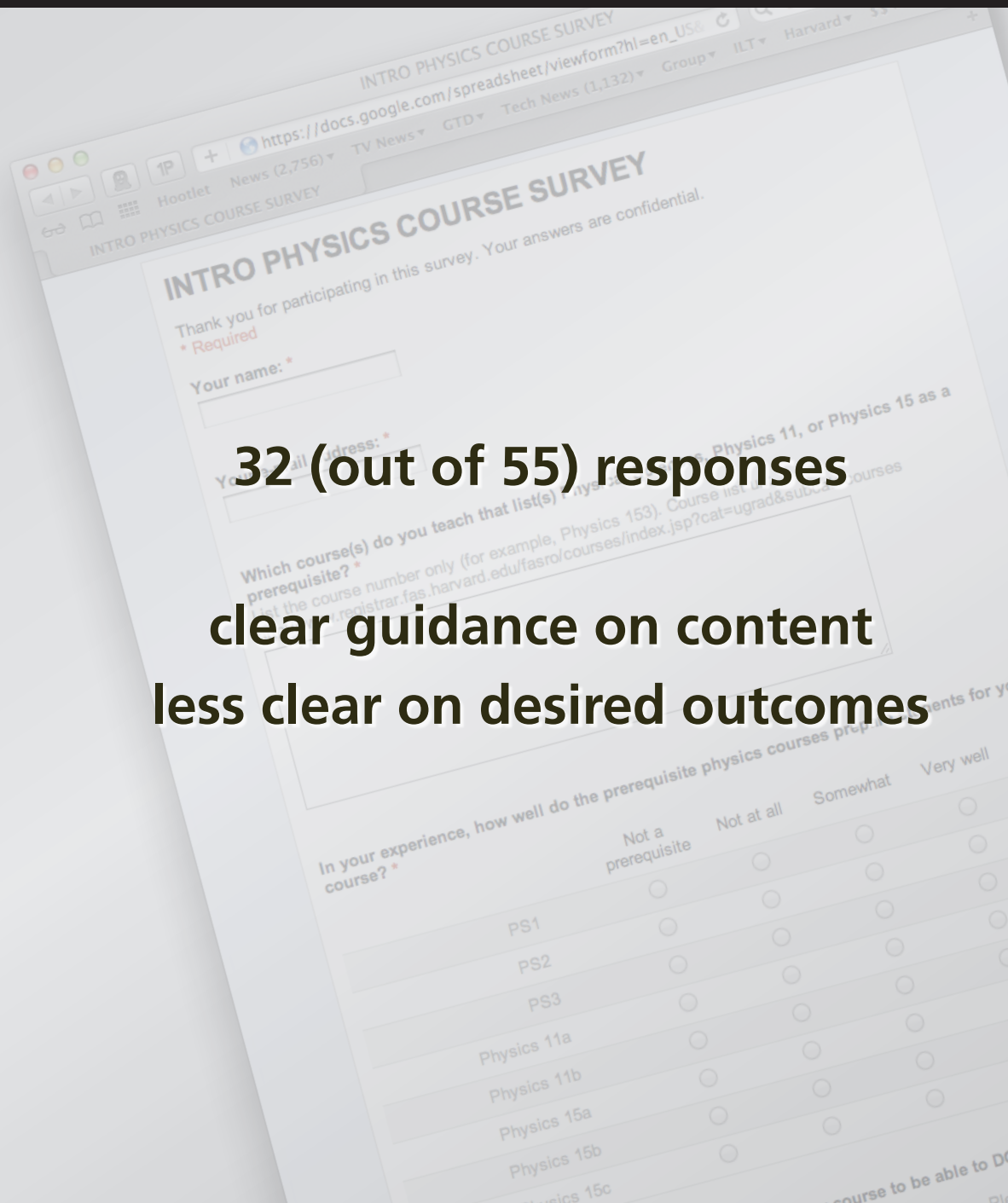


Course design



32 (out of 55) responses

Course design



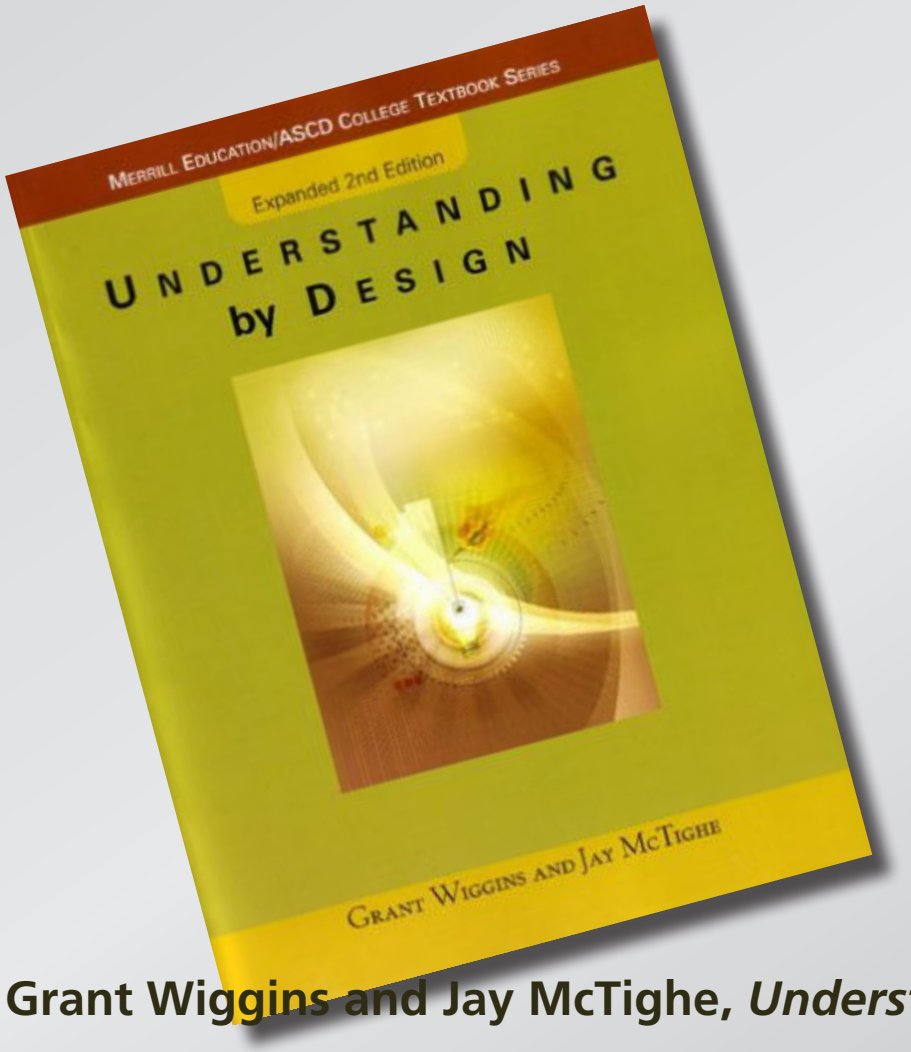
32 (out of 55) responses

clear guidance on content

less clear on desired outcomes

Course design

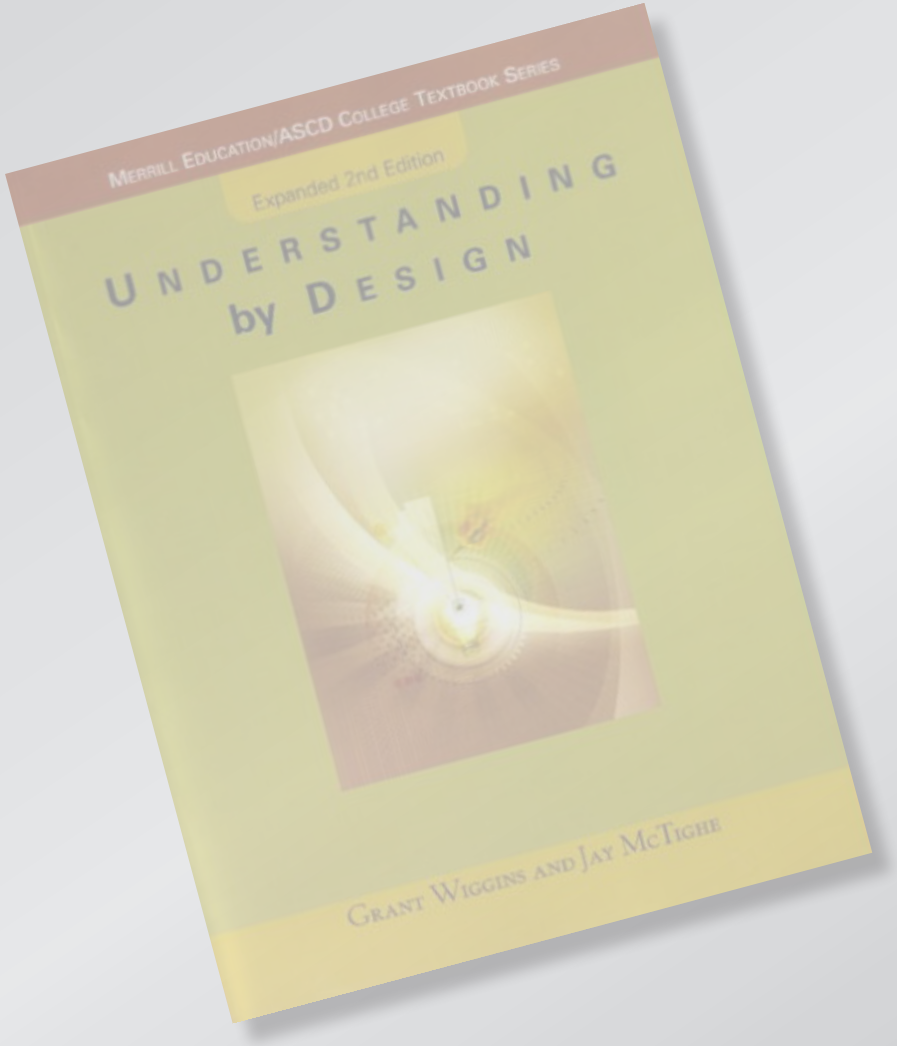
Setting learning goals



Grant Wiggins and Jay McTighe, *Understanding by Design* (Prentice Hall, 2001)

Course design

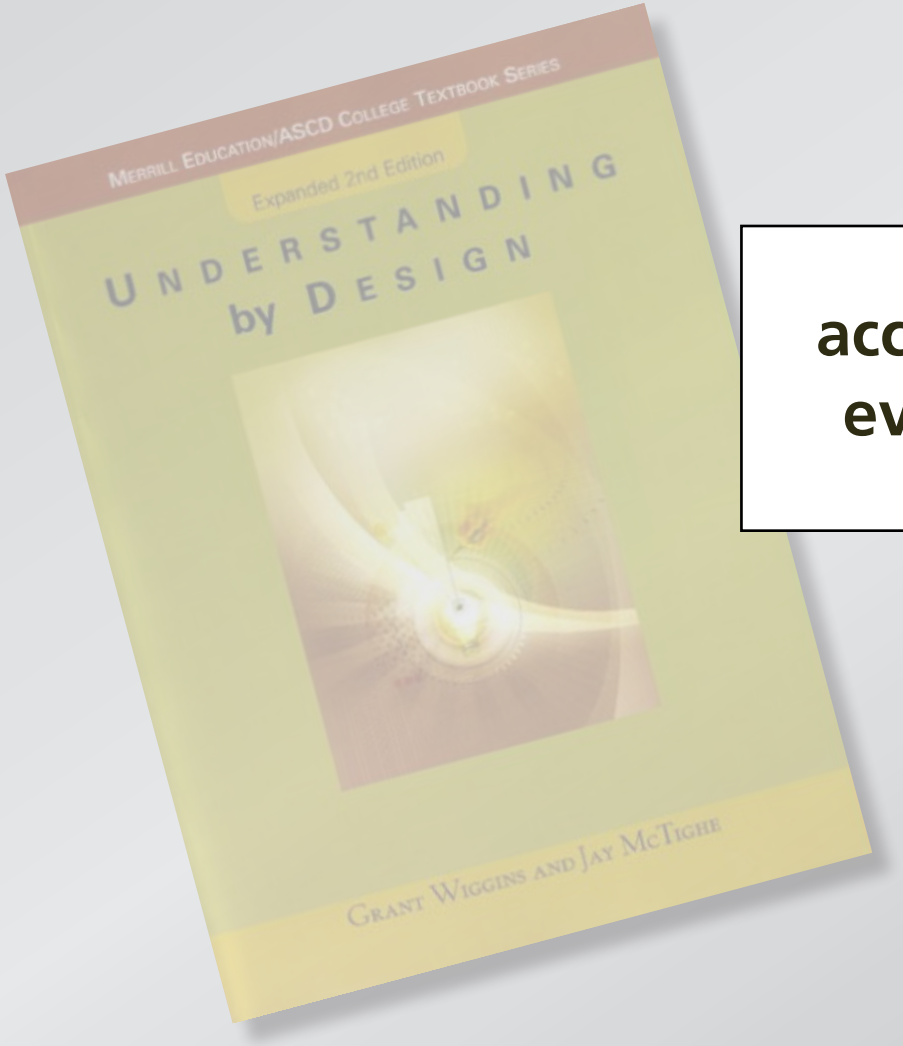
Backward design



desired outcomes

Course design

Backward design

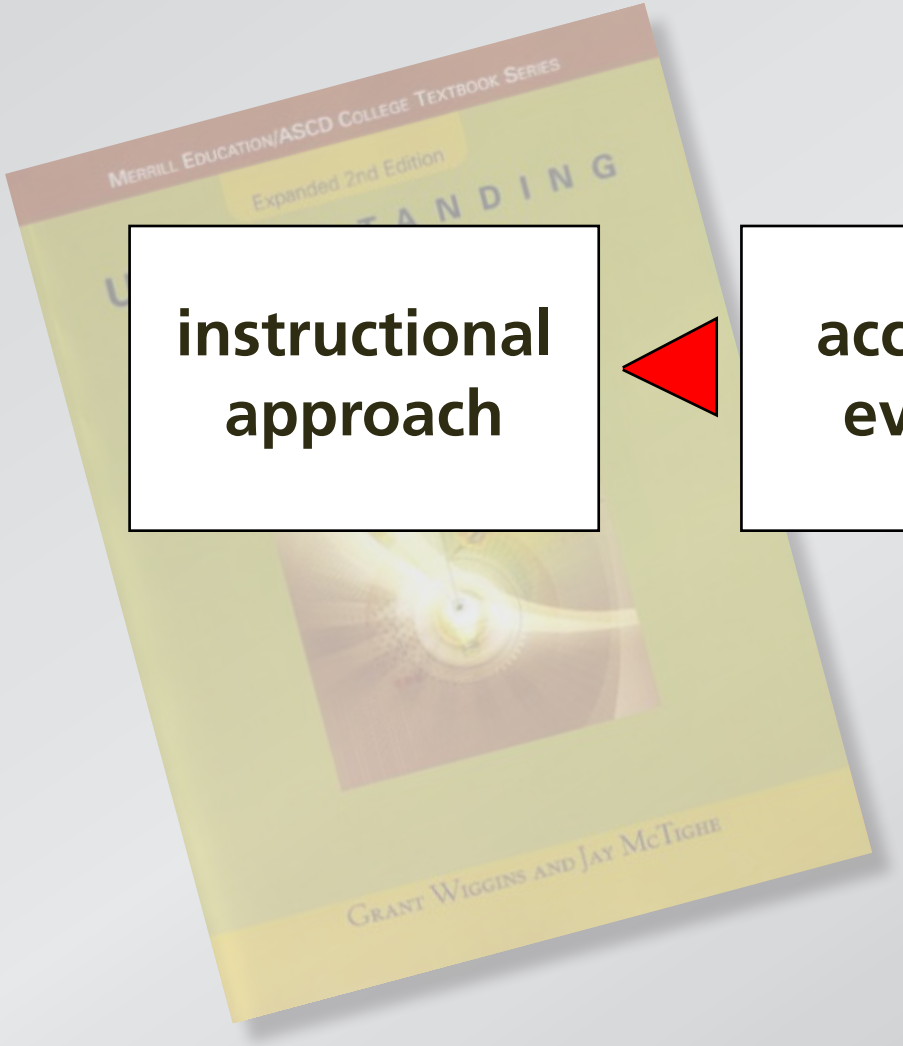


acceptable evidence

desired outcomes

Course design

Backward design



instructional approach

acceptable evidence

desired outcomes

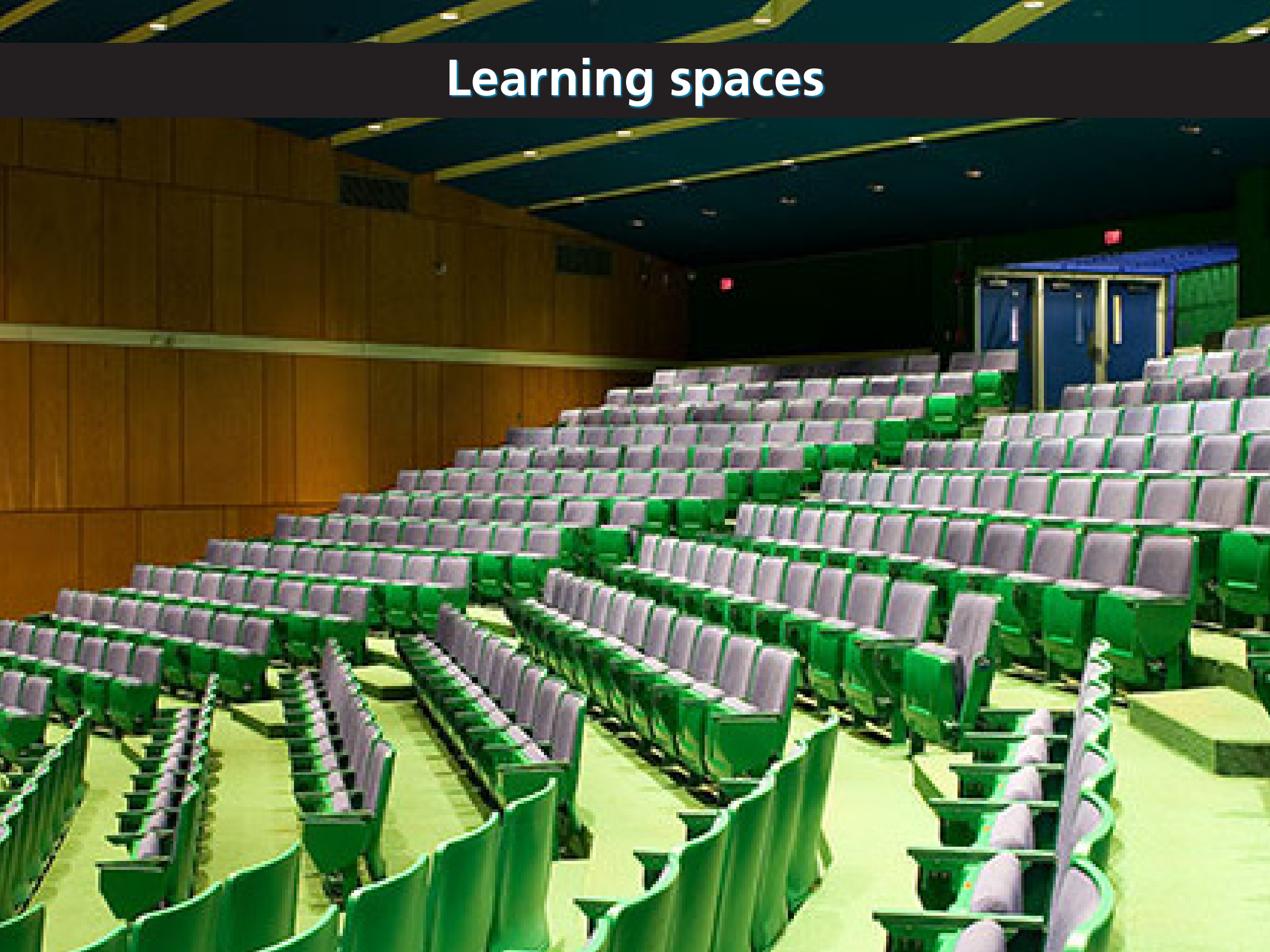
Learning spaces

Palace school, Mari, Syria, 2100 BC

Learning spaces

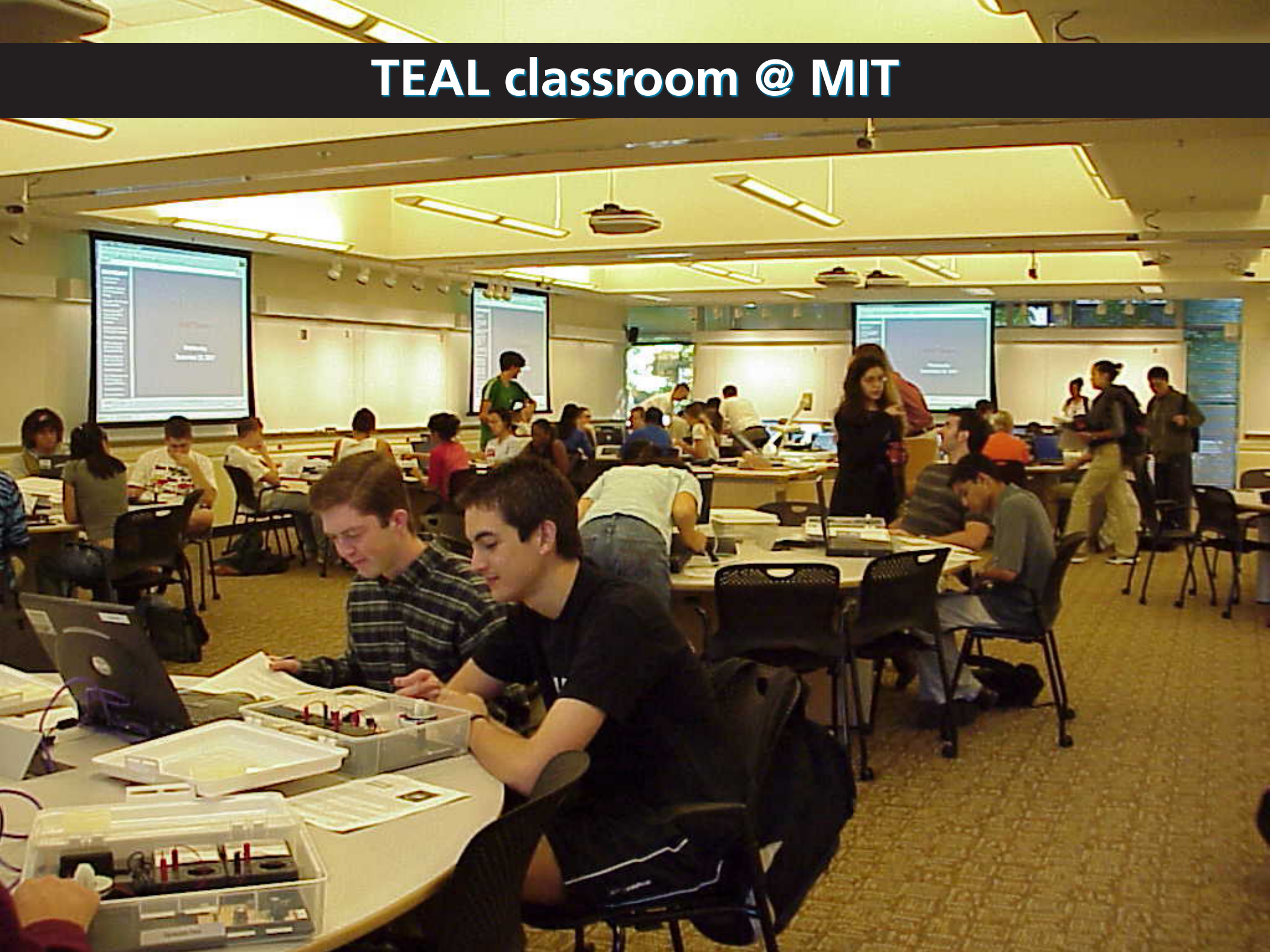
Learning spaces

Learning spaces

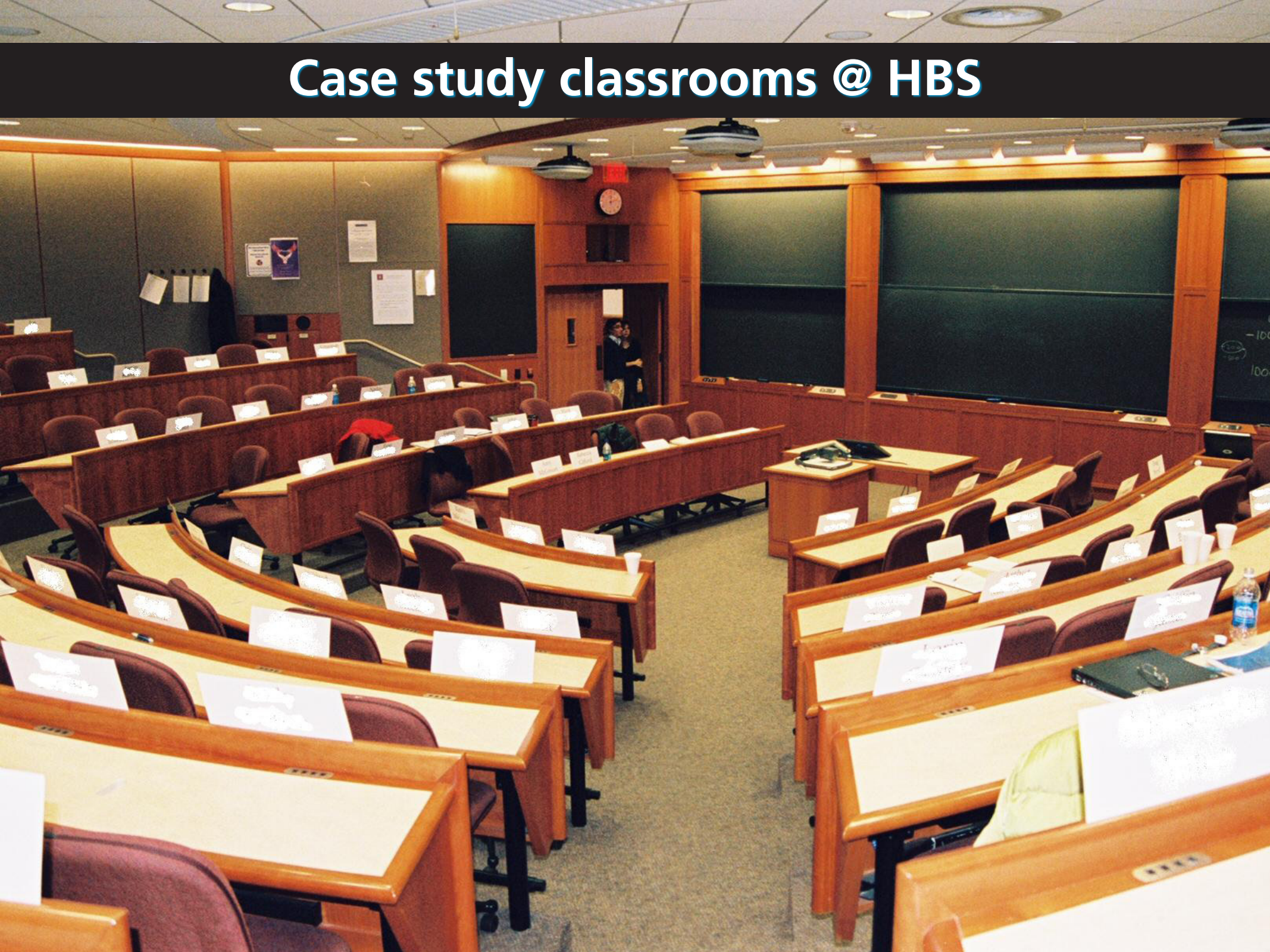


Learning spaces

TEAL classroom @ MIT

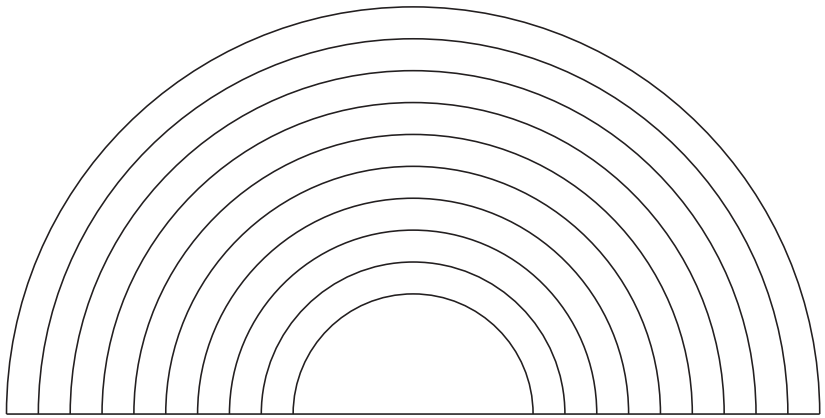


Case study classrooms @ HBS

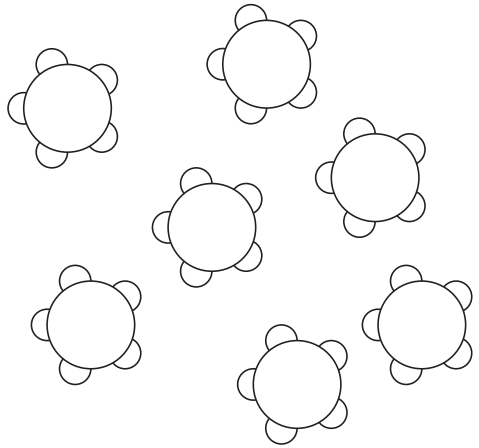


Classification

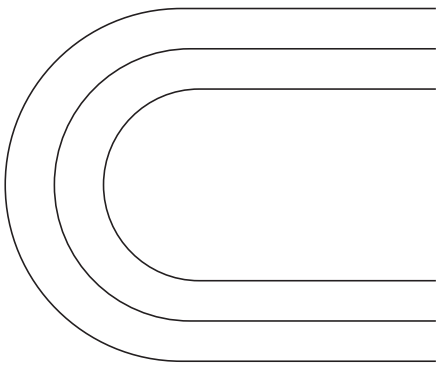
faculty centered



student centered



hybrid



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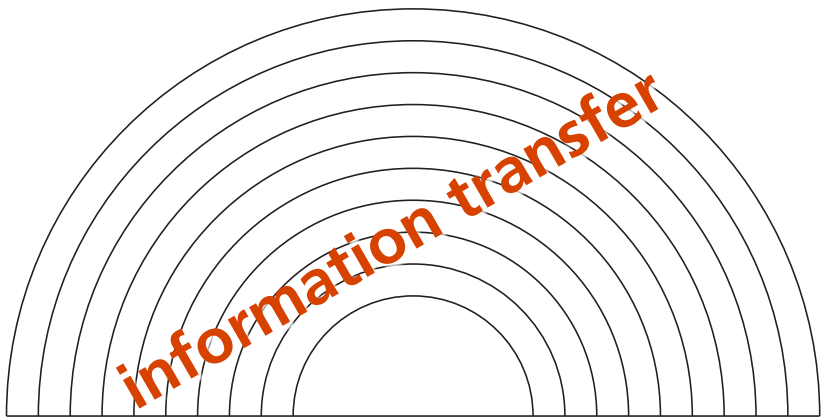

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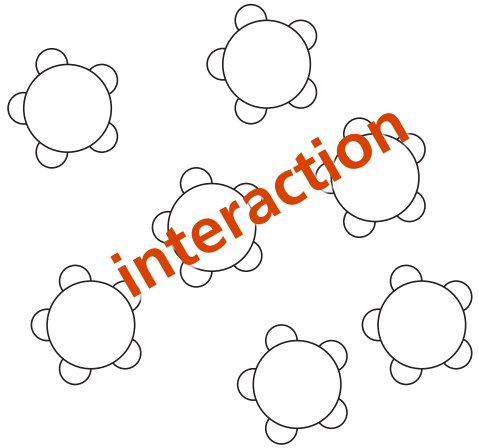

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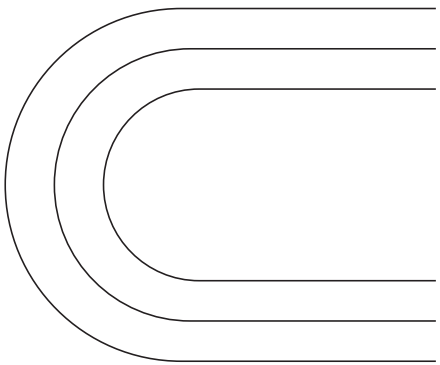

thanks to all my AP colleagues
for being so open-minded!

Follow me!  eric_mazur