

# Setting Learning Free



Unitek Annual Conference  
15 September 2023



# Setting Learning Free



@eric\_mazur

Unitek Annual Conference  
15 September 2023











Weekend long reads



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Life &amp; Arts

## Yuval Noah Harari: the world after coronavirus

This storm will pass. But the choices we make now could change our lives for years to come

Yuval Noah Harari MARCH 20 2020



Save

Humankind is now facing a global crisis. Perhaps the biggest crisis of our generation. The decisions people and governments take in the next few weeks will shape the world for years to come. They will shape not just our lives but the lives of future generations. We must act





Many short-term emergency measures will become a fixture of life. That is the nature of emergencies. They fast-forward historical processes. Decisions that in normal times could take years of deliberation are passed in a matter of hours. Immature and even dangerous technologies are pressed into service, because the risks of doing nothing are bigger. Entire countries serve as guinea-pigs in large-scale social experiments. What happens when everybody works from home and communicates only at a distance? What happens when entire schools and universities go online? In normal times, governments, businesses and educational boards would never agree to conduct such experiments. But these aren't normal times.







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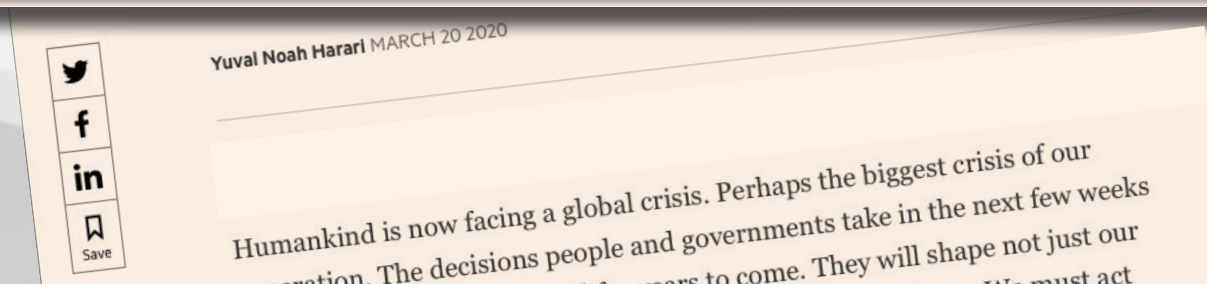
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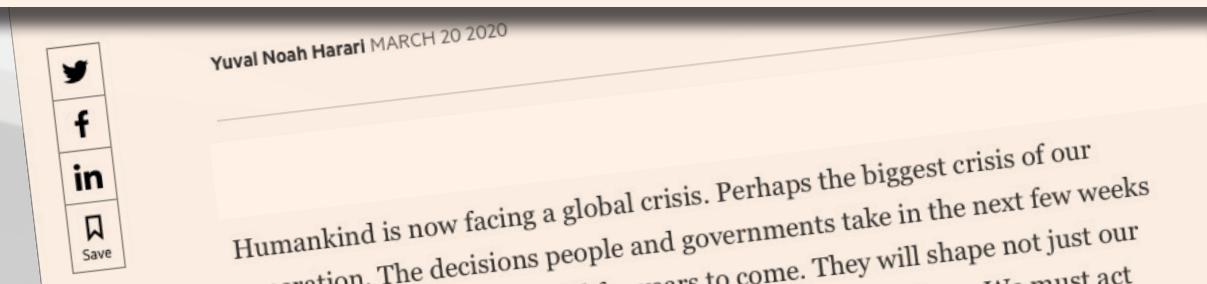




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**Will online teaching become a fixture of life?**

What happens when everybody works from home and communicates only at a distance? What happens when entire schools and universities go online? In normal times, governments, businesses and educational boards would never agree to conduct such experiments. But these aren't normal times.





lkbeat

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THE WALL STREET JOURNAL.

A photograph of a woman with long brown hair, wearing a green shirt and jeans, sitting on a tan sofa in a living room. She is looking at a laptop. To her left, a boy in a blue shirt and red shorts is sitting on the sofa, looking at a tablet. To her right, a boy in a red and blue plaid shirt and blue shorts is sitting on the sofa, looking at a tablet. In the foreground, a girl in a white dress and blue headband is standing, looking down. Another boy in a red shirt is sitting on the floor in the foreground. The living room has two floor lamps with warm light, a coffee table with a blue tablet and books, and a patterned rug. The text 'EDUCATION' is visible on the coffee table.

# The Results Are In for Remote Learning: It Didn't Work

The pandemic forced schools into a crash course in online education. Problems piled up quickly. 'I find it hectic and stressful'

Lucia Curatolo-Boylan supervises the online schooling of her four children, ages 4 to 10, in Staten Island, N.Y. KEVIN HAGEN FOR THE WALL STREET JOURNAL

by Howard and Lee Hawkins



lkbeat

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THE WALL STREET JOURNAL.



Popular

Latest

*The Atlantic*

IDEAS

# Remote Learning Is a Bad Joke

My kid can't handle a virtual education, and neither can I.

AUGUST 18, 2020

**Emily Gould**

Author and essayist



RECOMMEN  
READING

Put Anthony Fauci in  
Dunk Tank

CONOR FRIEDERSDORF

Why Millennials Can  
Up





**The reason? Bad pedagogy!**



**information  
transfer**

**sense-making**



# Traditional model

**class**

**information  
transfer**

**home**

**sense-making**

# Traditional model

**class**

**information  
transfer**

instructor-paced  
synchronous  
lecture

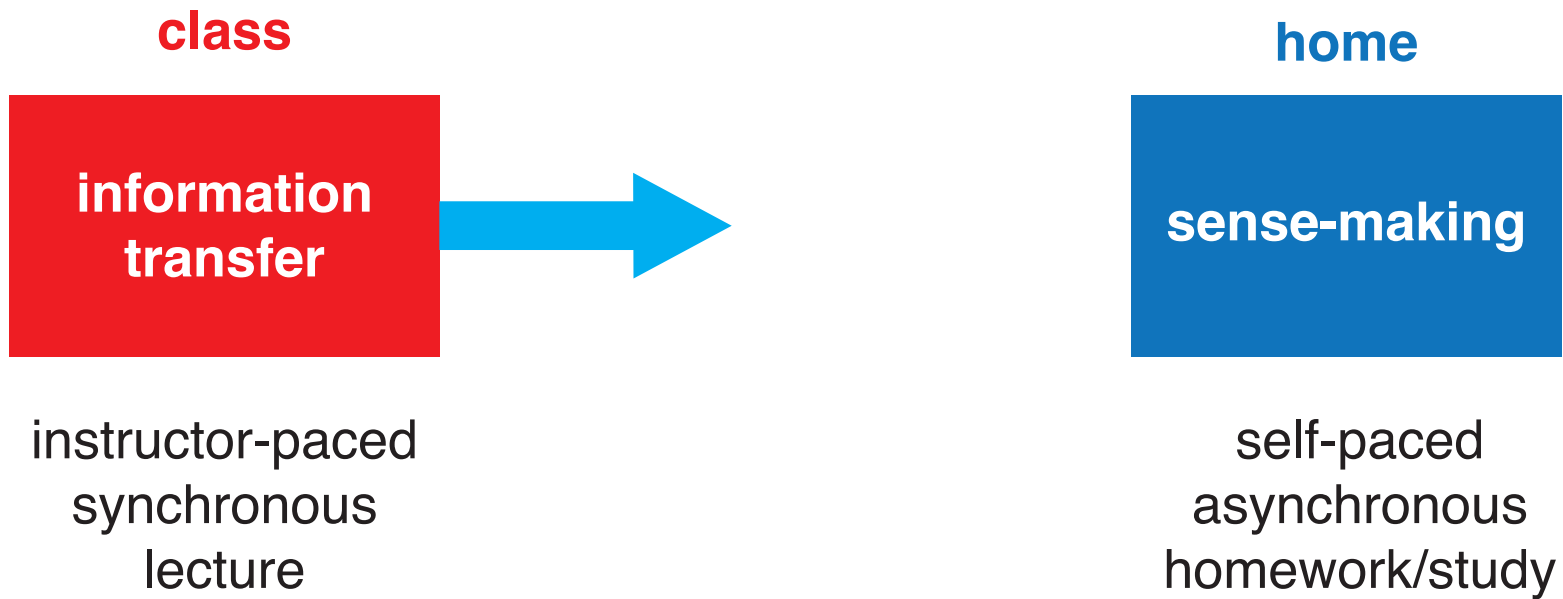
**home**

**sense-making**

self-paced  
asynchronous  
homework/study



# Traditional model online



# Traditional model online

class

information  
transfer

instructor-paced  
synchronous  
lecture

home

information  
transfer

instructor-paced  
synchronous  
**online** lecture

home

sense-making

self-paced  
asynchronous  
homework/study



# Traditional model online

class

information  
transfer

instructor-paced  
synchronous  
lecture

home

information  
transfer

instructor-paced  
**asynchronous**  
**recorded** lecture

home

sense-making

self-paced  
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home work/study

# Traditional model online

class

information  
transfer

instructor-paced  
synchronous  
lecture

home

information  
transfer

instructor-paced  
**asynchronous**  
**recorded** lecture

home

sense-making

self-paced  
asynchronous  
home work/study

**all alone!**



A group of people are working in a modern office environment. In the foreground, a woman with blonde hair is looking at a laptop screen. Next to her, a woman with dark hair is looking down at a notebook. In the background, several other people are working at desks with laptops. The office has large windows and a bright, airy feel. The text "Small wonder!" is overlaid in the center of the image.

**Small wonder!**

# Traditional model

**class**

**information  
transfer**

**home**

**sense-making**



# Flipped model

**home**

**information  
transfer**

**class**

**sense-making**

# Flipped model

**home**

**information  
transfer**

self-paced  
asynchronous

**class**

**sense-making**

instructor-led  
synchronous  
& **interactive**



# Flipped model

home

information  
transfer

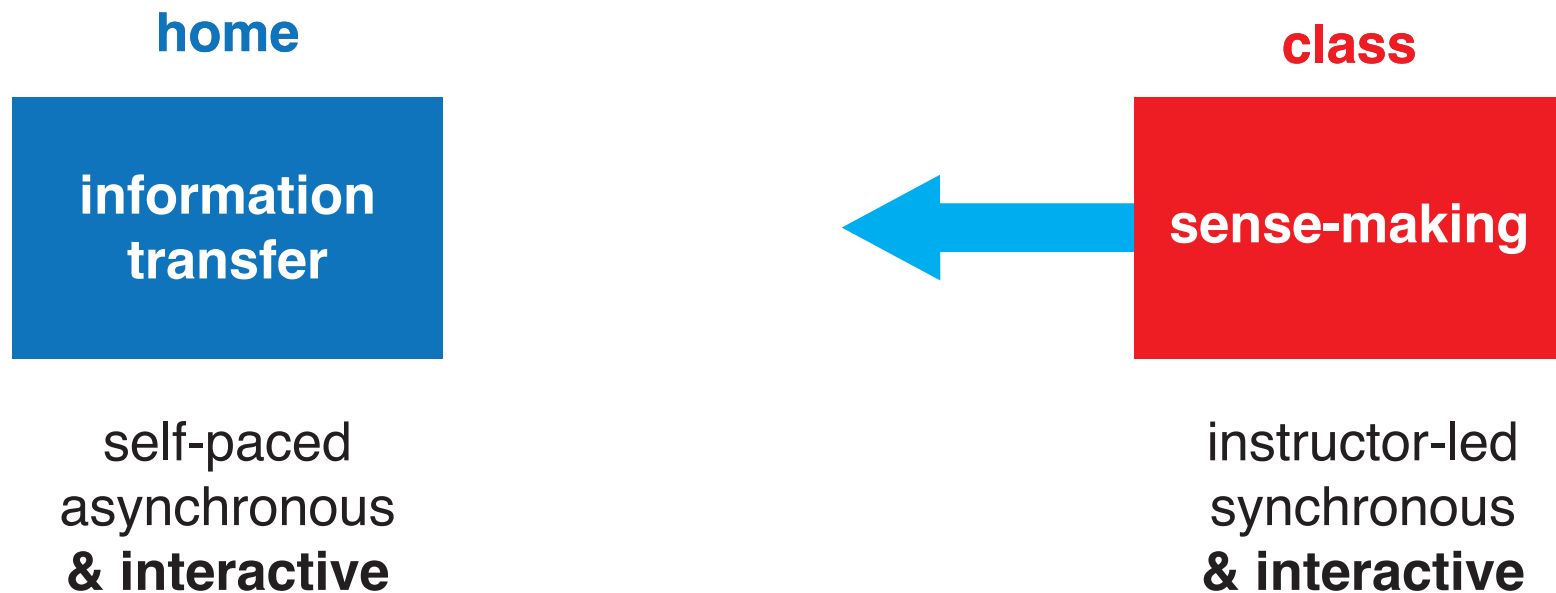
self-paced  
asynchronous  
& **interactive**

class

sense-making

instructor-led  
synchronous  
& **interactive**

# Flipped model online





# Flipped model online

home

**information  
transfer**

self-paced  
asynchronous  
& **interactive**

home

**sense-making**

instructor-led  
synchronous  
& **interactive**

class

**sense-making**

instructor-led  
synchronous  
& **interactive**

# Flipped model online







## **1** pandemic lessons



**1** pandemic lessons

**2** new normal





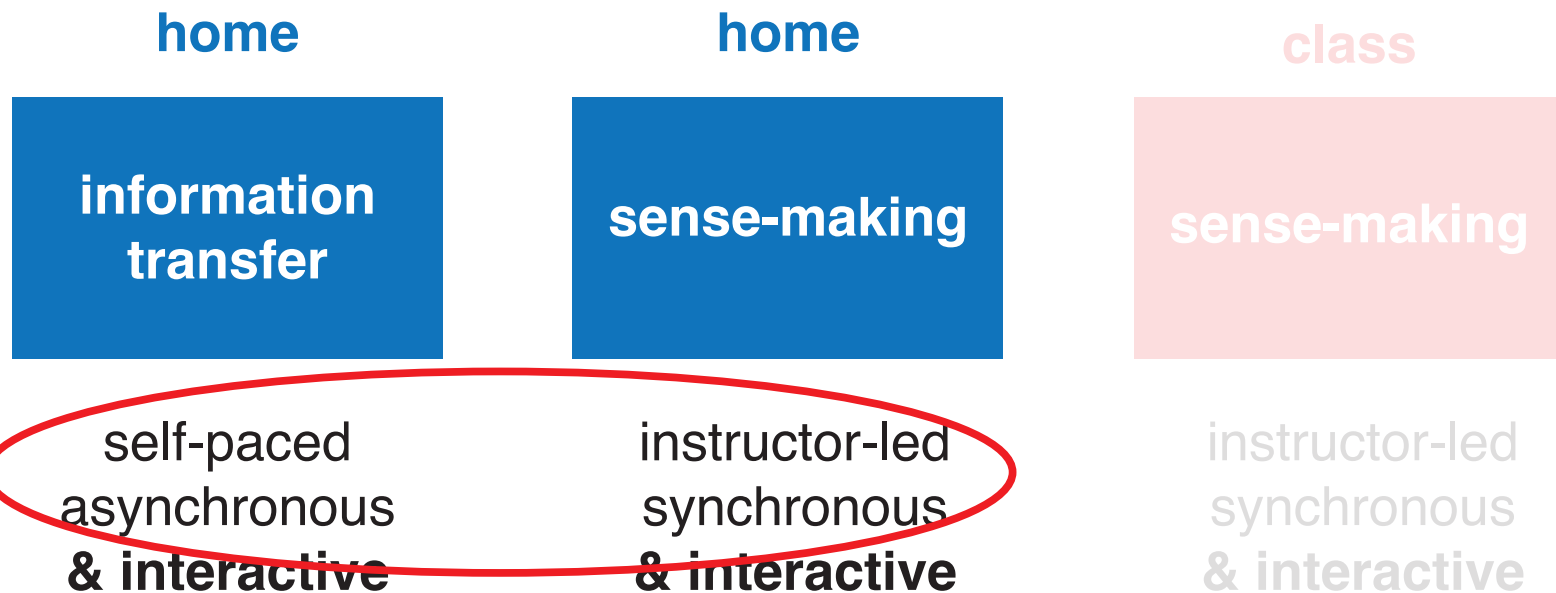
- 1 pandemic lessons
- 2 new normal
- 3 self-paced PI

# Optimize instructional face-to-face time

A group of people in a modern office setting, working on laptops and discussing documents, illustrating the concept of optimizing face-to-face instructional time.



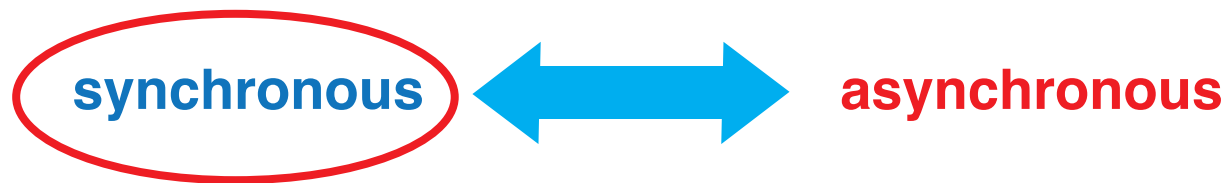
# Optimize instructional face-to-face time



# Optimize instructional face-to-face time

synchronous  asynchronous

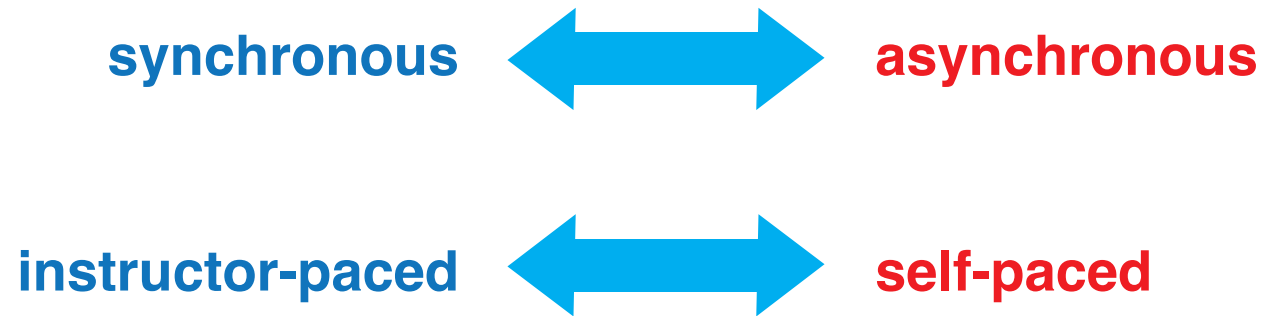
# Optimize instructional face-to-face time



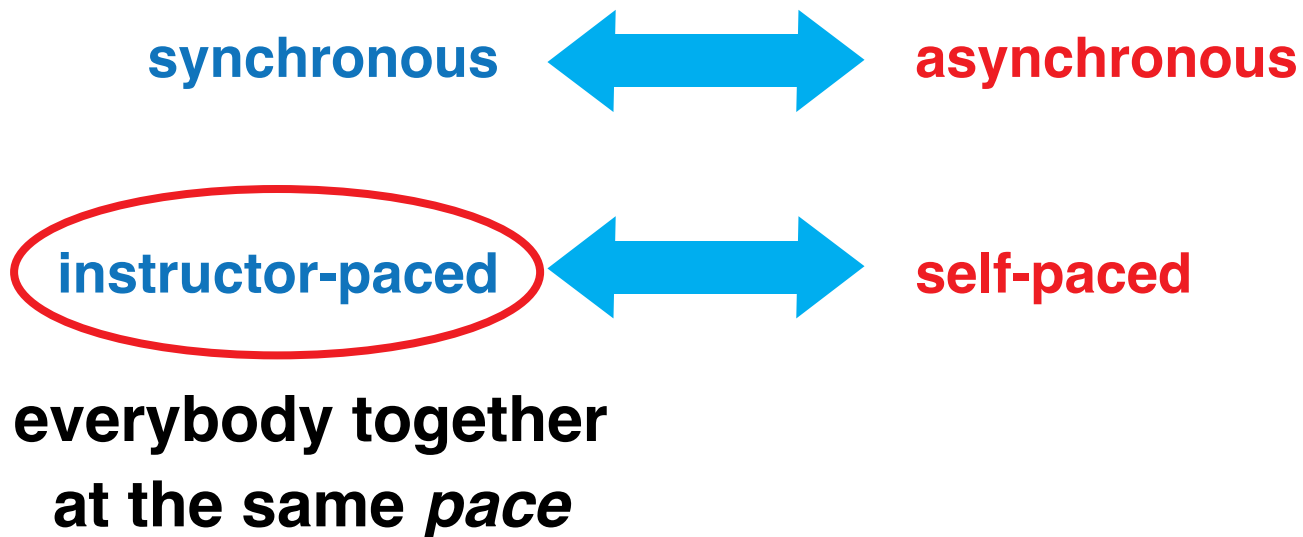
**everybody together  
at the same *time***



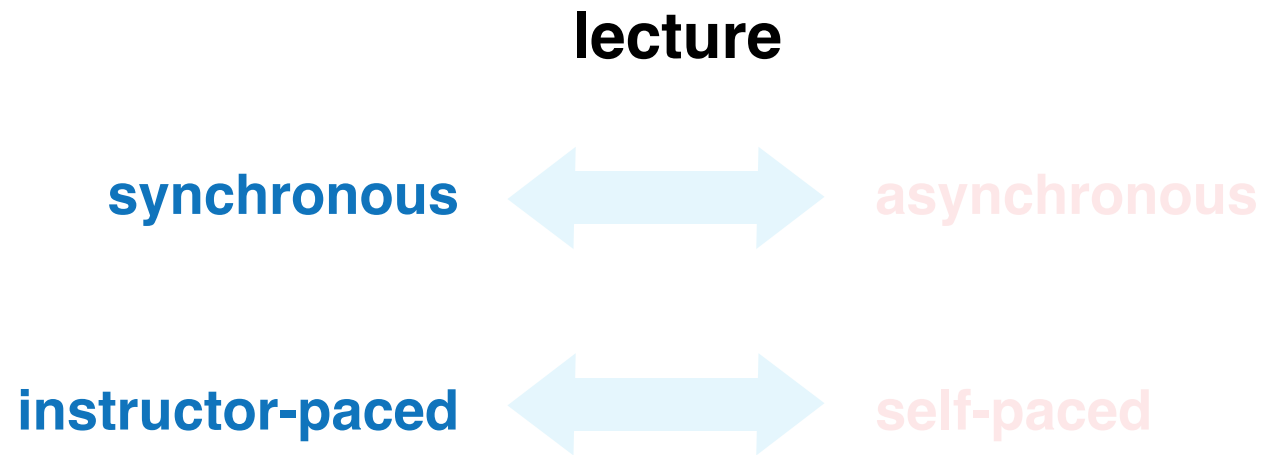
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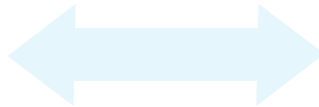




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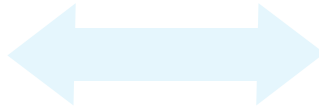
**recorded lecture**

synchronous



**asynchronous**

**instructor-paced**

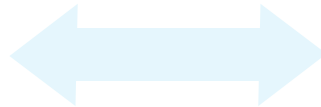


**self-paced**

# Optimize instructional face-to-face time

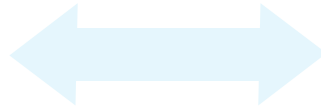
recorded lecture

synchronous



asynchronous

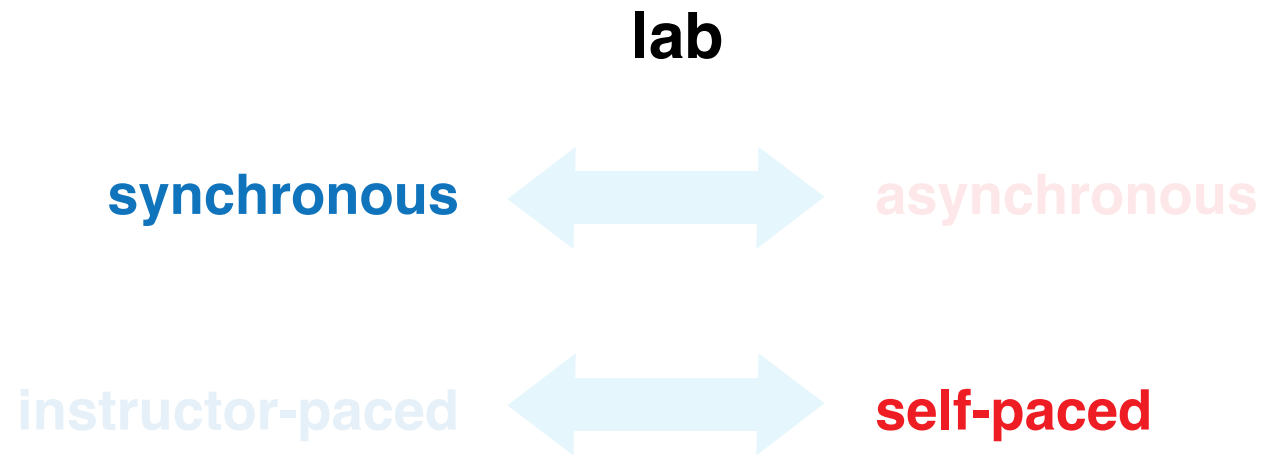
instructor-paced



self-paced

1.5x!

# Optimize instructional face-to-face time

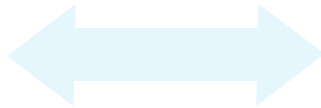




# Optimize instructional face-to-face time

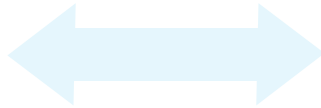
homework/study

synchronous



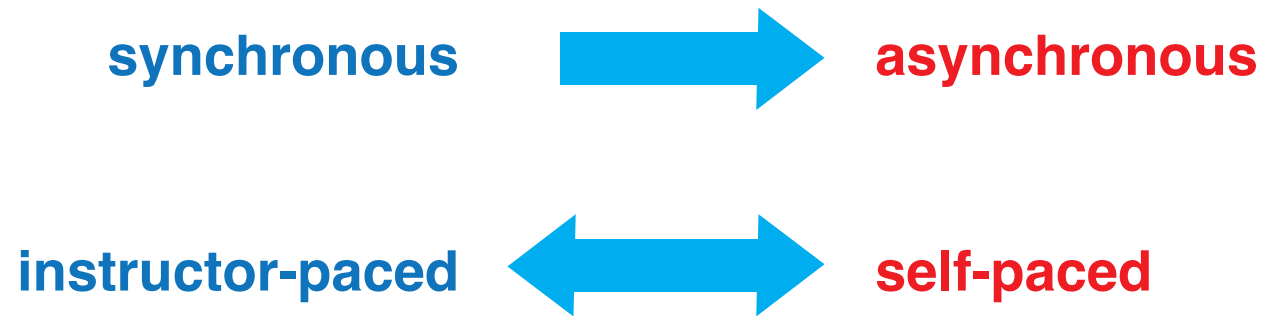
asynchronous

instructor-paced

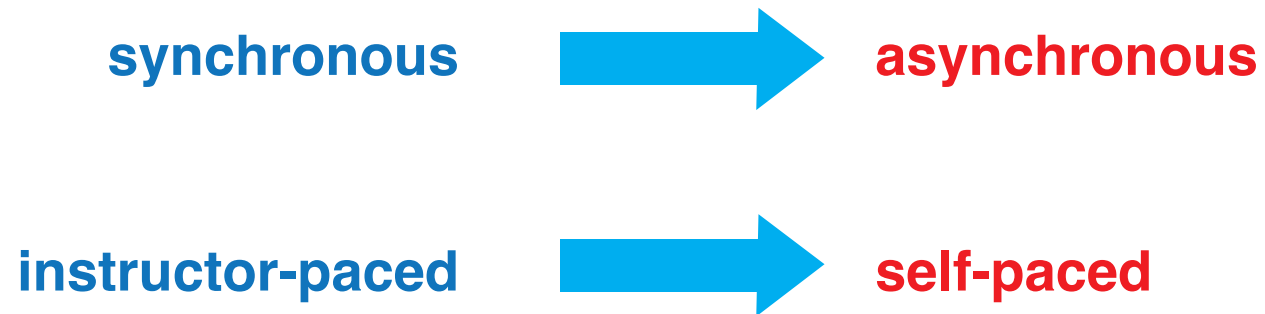


self-paced

# Optimize instructional face-to-face time

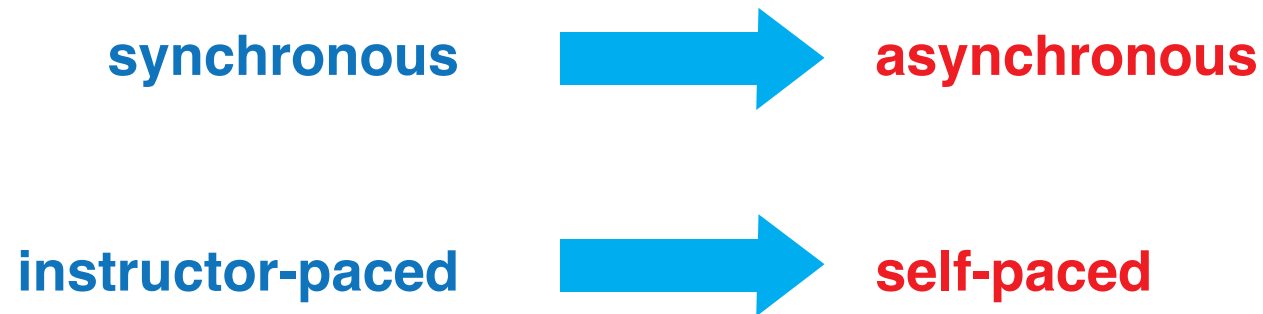


# Optimize instructional face-to-face time





# Optimize instructional face-to-face time



**more time to help students  
where it really matters!**

A group of people are working in a modern office or classroom setting. They are seated around a large, light-colored circular table, using laptops and notebooks. The background shows more people working at desks near large windows. The text "Try this exercise!" is overlaid in the center of the image.

**Try this exercise!**

# Optimize team face-to-face time

synchronous

collaborative work



# Optimize team face-to-face time

**synchronous**

**collaborative work**

- not all students engaged
- inefficient team work
- poor use of staff time
- no quality control

# Optimize team face-to-face time

**synchronous**

**collaborative work**

- not all students engaged
- inefficient team work
- poor use of staff time
- no quality control

**asynchronous**

**individual  
work**

# Optimize team face-to-face time

**synchronous**

**collaborative work**

- not all students engaged
- inefficient team work
- poor use of staff time
- no quality control

**asynchronous**

**individual  
work**



**synchronous**

**team  
work**



# Optimize team face-to-face time

**synchronous**

**collaborative work**

- not all students engaged
- inefficient team work
- poor use of staff time
- no quality control

**asynchronous**

**individual  
work**



**synchronous**

**team  
work**



**team  
check**

# Optimize team face-to-face time

## synchronous

### collaborative work

- not all students engaged
- inefficient team work
- poor use of staff time
- no quality control

## asynchronous

individual  
work

all engaged



## synchronous

team  
work

efficient team



team  
check

quality control

# Establish continuous accountability

*Inside Higher Ed, Yes, Virginia, there is a better way to grade*



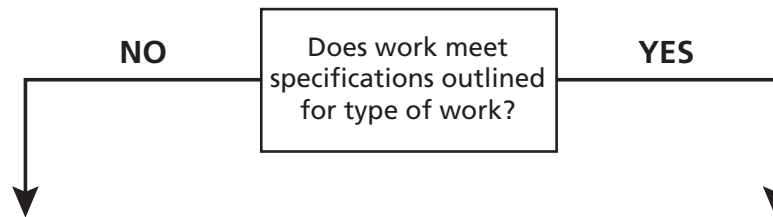
A group of people in a modern office setting, working on laptops and discussing projects. The image is faded and serves as a background for the text.

**Establish continuous accountability**

**Specifications grading**

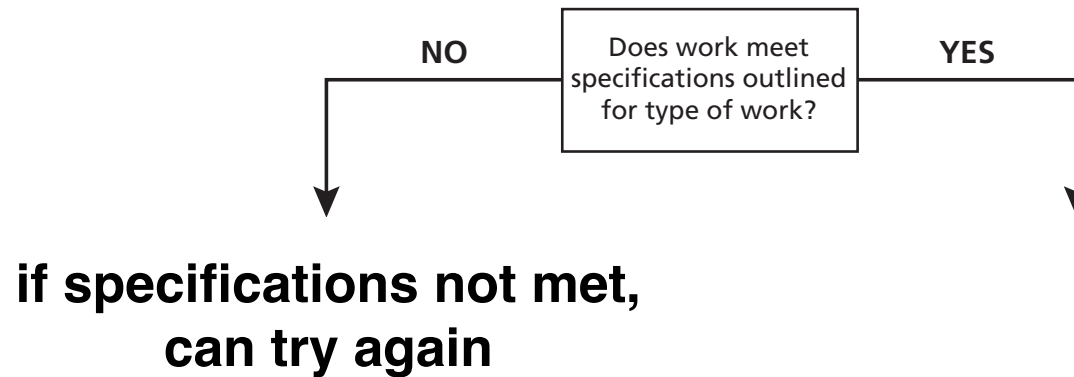
***Inside Higher Ed, Yes, Virginia, there is a better way to grade***

# Establish continuous accountability



Inside Higher Ed, *Yes, Virginia, there is a better way to grade*

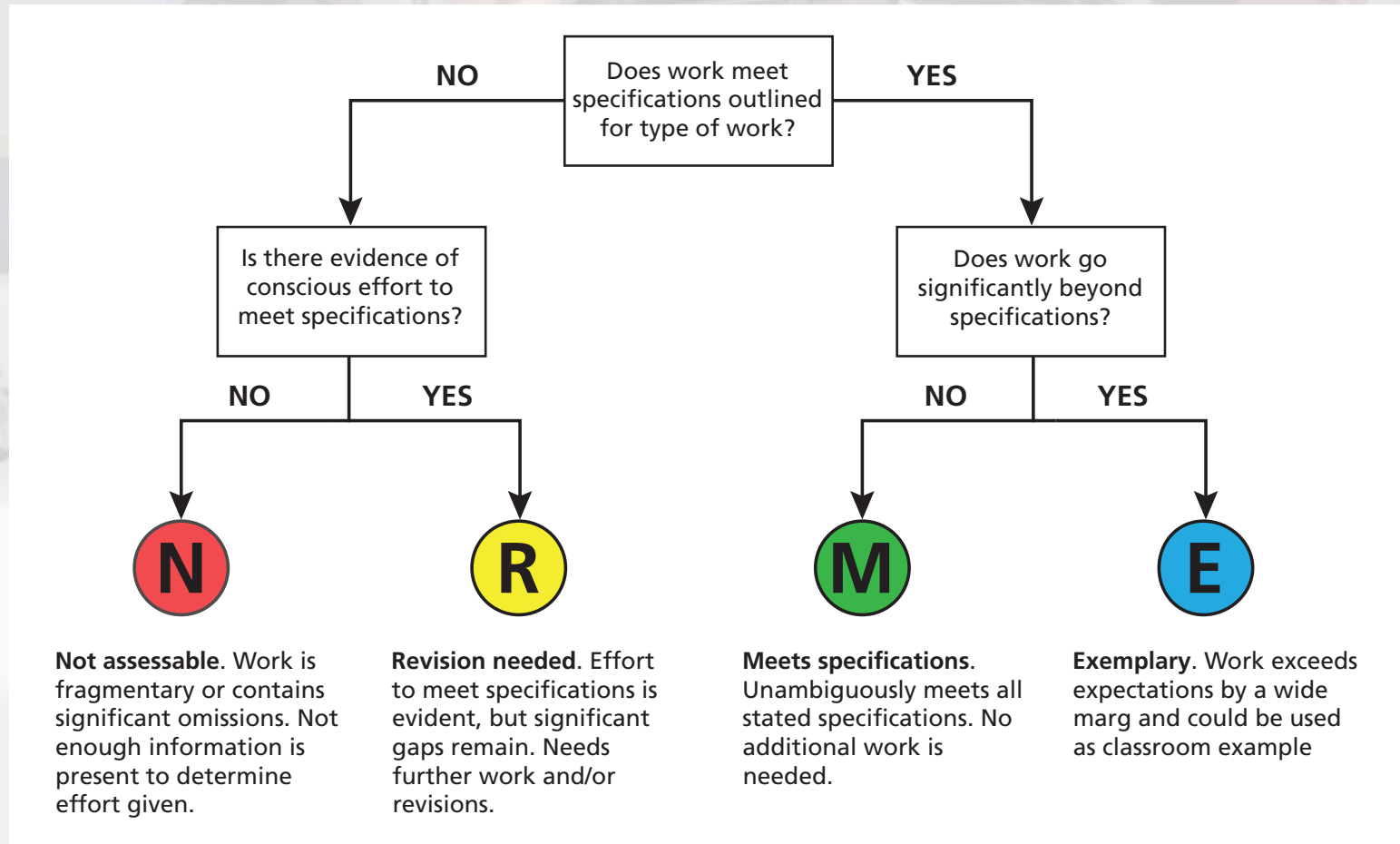
# Establish continuous accountability



**Inside Higher Ed, *Yes, Virginia, there is a better way to grade***

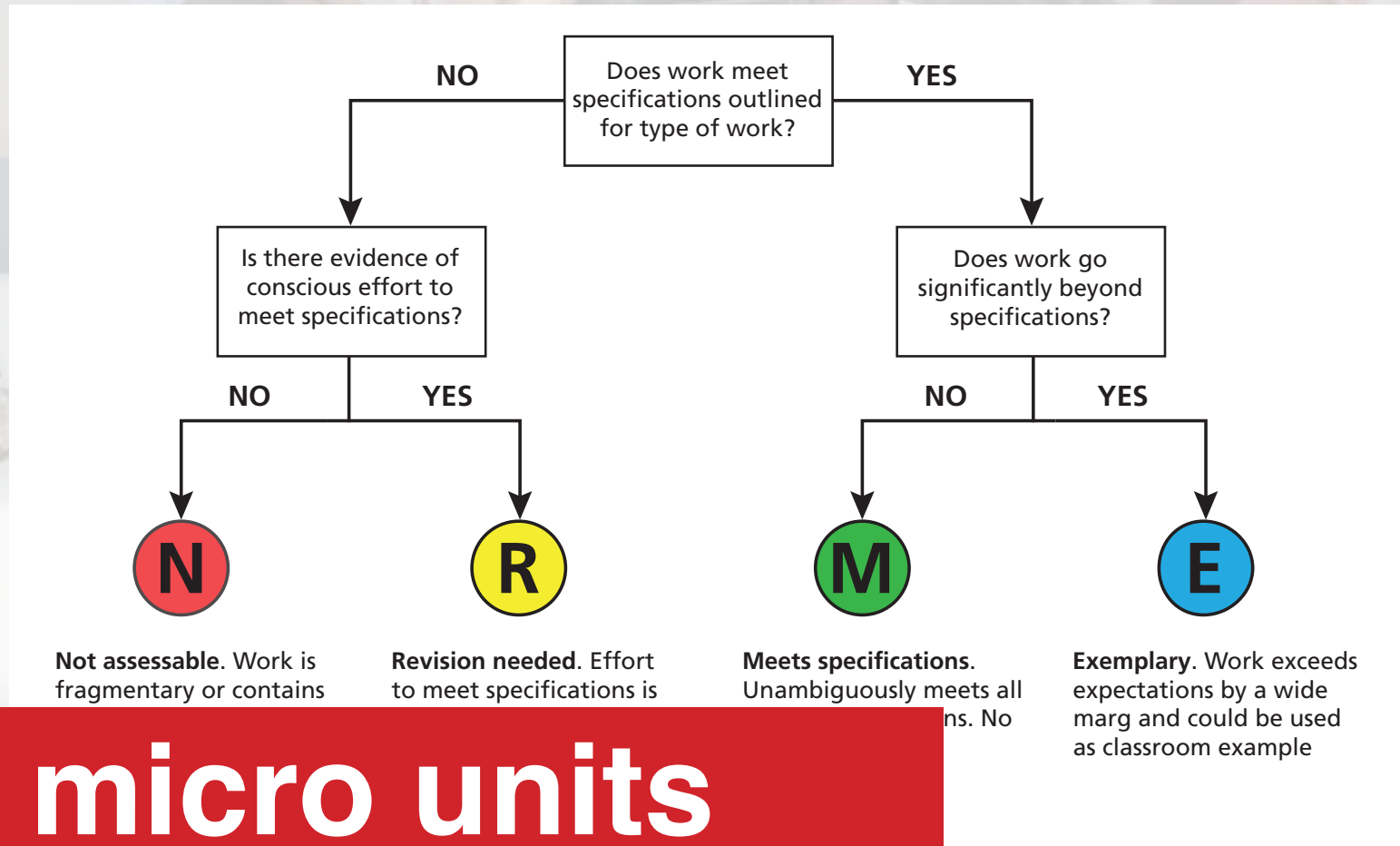


# Establish continuous accountability



**Inside Higher Ed, *Yes, Virginia, there is a better way to grade***

# Establish continuous accountability

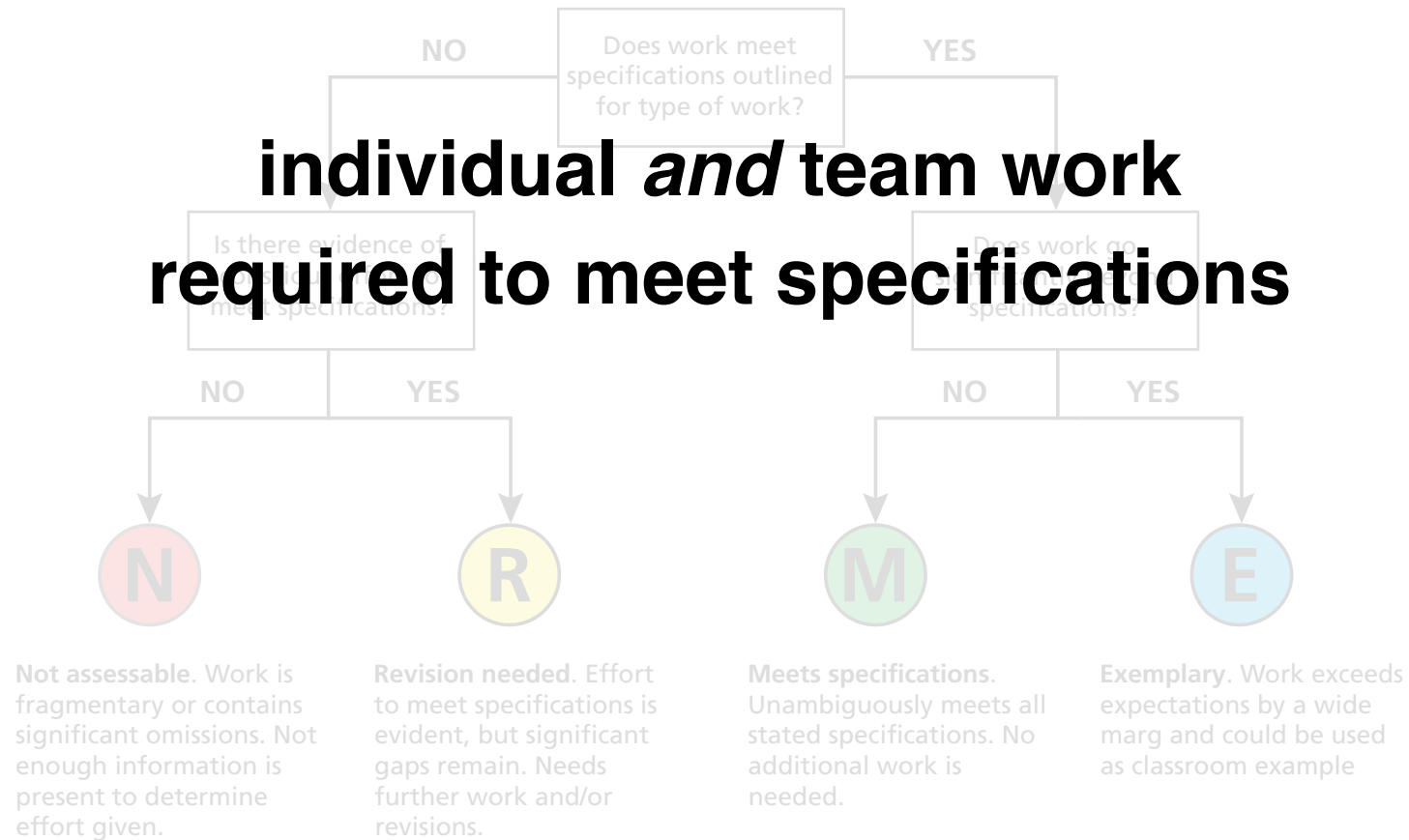


## 70 micro units

Inside Higher Ed, *Yes, Virginia, there is a better way to grade*

# Establish continuous accountability

## individual *and* team work required to meet specifications



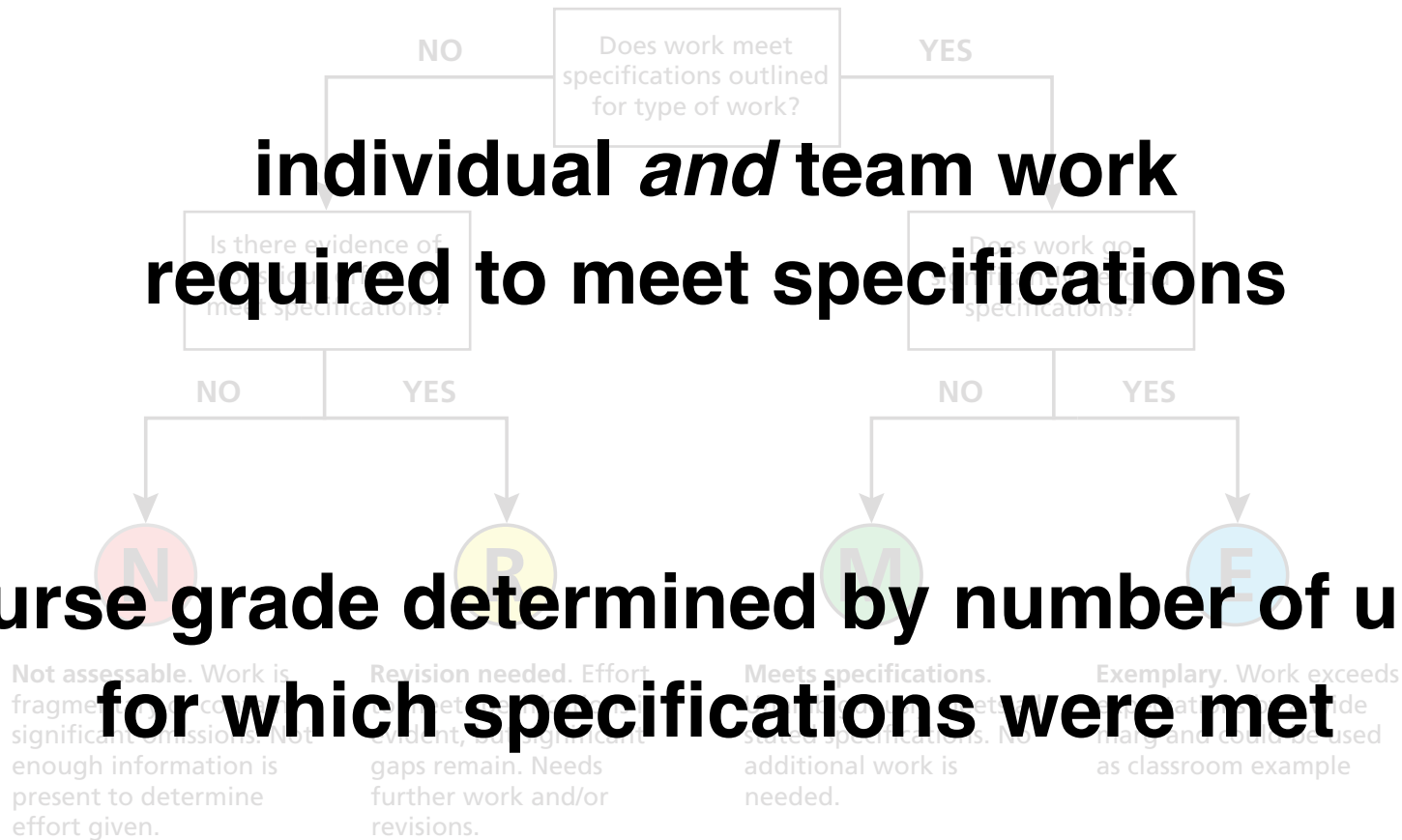
Inside Higher Ed, *Yes, Virginia, there is a better way to grade*



# Establish continuous accountability

**individual *and* team work  
required to meet specifications**

**course grade determined by number of units  
for which specifications were met**



**Inside Higher Ed, *Yes, Virginia, there is a better way to grade***

# **Shift ownership of learning space**

**instead of all students coming to instructor's room...**

# **Shift ownership of learning space**

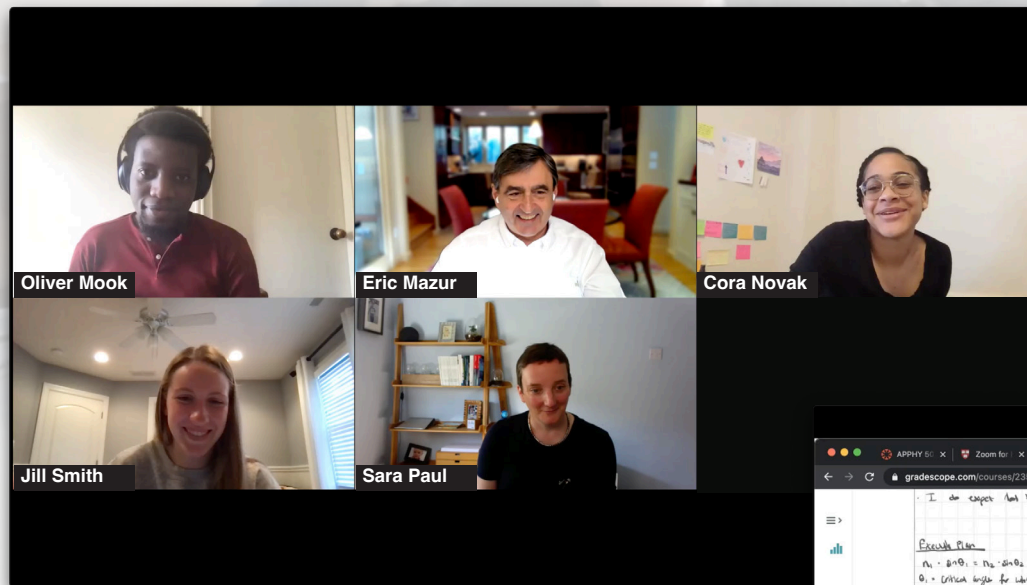
**instead of all students coming to instructor's room...**

**...instructional staff visits each team's own room**



# Shift ownership of learning space

80 students in one room → 20 rooms with 4 students



Assignment Module 25 • UNGRADED

STUDENT  
Codi-Ann Reid

TOTAL POINTS  
-/ 0 pts

QUESTION 1  
Cover Page 0 pts

QUESTION 2  
Question 1 0 pts

QUESTION 3  
Question 2 0 pts

QUESTION 4  
Question 3 0 pts

QUESTION 5  
Reflection 0 pts

3: Question 2

Reselect Pages Download Original Submission History Resubmit

# Shift ownership of learning space

## every student on front row

The collage illustrates the shift in ownership of the learning space. It features a Zoom meeting grid with five participants: Oliver Mook, Eric Mazur, Cora Novak, Jill Smith, and Sara Paul. Below the grid is a screenshot of a physics assignment on a grid background, showing handwritten notes and diagrams. The assignment includes the following text:

I do expect that the light will bend and that it could be possible to try to find

Example 10.10

$n_1 \sin \theta_1 = n_2 \sin \theta_2$   
 $\theta_1 = \text{critical angle for which total internal reflection occurs}$   
 $\theta_1 = 90^\circ, \sin 90^\circ = 1$   
 $n_1 \sin \theta_1 = n_2 \sin \theta_2$   
 $n_1 \sin 90^\circ = n_2 \sin \theta_2$   
 $n_1 = n_2 \sin \theta_2$   
 $\sin \theta_2 = \frac{n_1}{n_2}$   
 $\theta_2 = \sin^{-1}(\frac{n_1}{n_2})$

Calculate the  $\theta_c$  for an interface between 2 media with indices of refraction

$n_1 = 1.5, n_2 = 1.0$   
 $\sin \theta_c = \frac{n_2}{n_1} = \frac{1.0}{1.5} = \frac{2}{3}$   
 $\theta_c = \sin^{-1}(\frac{2}{3})$   
 $\cos^2 \theta_c = 1 - \sin^2 \theta_c = 1 - \frac{4}{9} = \frac{5}{9}$   
 $\cos \theta_c = \sqrt{\frac{5}{9}} = \frac{\sqrt{5}}{3}$   
 $\theta_c = \cos^{-1}(\frac{\sqrt{5}}{3})$

$n_1 \sin \theta_1 = n_2 \sin \theta_2$   
 $1 \cdot \sin \theta_1 = 1.5 \sin \theta_2$   
 $\sin \theta_1 = 1.5 \sin \theta_2$   
 $\theta_1 = \sin^{-1}(1.5 \sin \theta_2)$   
 $\theta_1 = \sin^{-1}(1.5 \sin 90^\circ)$   
 $\theta_1 = \sin^{-1}(1.5)$   
 $\theta_1 = 90^\circ$

$\theta_c = \sin^{-1}(\frac{2}{3})$   
 $\theta_c = 41.8^\circ$

The assignment also includes a diagram of a light ray incident on a boundary between two media, with angles  $\theta_1$  and  $\theta_2$  labeled. The right side of the screenshot shows the assignment details: Assignment Module 25, UNGRADED, STUDENT: Codi-Ann Reid, TOTAL POINTS: - / 0 pts, and a list of questions with their respective points.

Assignment Module 25 • UNGRADED

STUDENT: Codi-Ann Reid

TOTAL POINTS: - / 0 pts

QUESTION 1: Cover Page (0 pts)

QUESTION 2: Question 1 (0 pts)

QUESTION 3: Question 2 (0 pts)

QUESTION 4: Question 3 (0 pts)

QUESTION 5: Reflection (0 pts)



# Shift ownership of learning space

every student on front row & address each by their name

The collage illustrates pandemic lessons in education. It features a Zoom meeting grid with five participants: Oliver Mook, Eric Mazur, Cora Novak, Jill Smith, and Sara Paul. Below the grid is a screenshot of a Gradescope assignment page for 'Assignment Module 25' showing handwritten physics notes and a diagram of a light ray reflecting off a surface. To the right of the Gradescope page is a vertical strip of four small video thumbnails showing individual students.

**Zoom Meeting Participants:**

- Oliver Mook
- Eric Mazur
- Cora Novak
- Jill Smith
- Sara Paul

**Gradescope Assignment Module 25 (UNGRADED)**

STUDENT: Codi-Ann Reid  
TOTAL POINTS: - / 0 pts

QUESTION 1: Cover Page (0 pts)  
QUESTION 2: Question 1 (0 pts)  
QUESTION 3: Question 2 (0 pts)  
QUESTION 4: Question 3 (0 pts)  
QUESTION 5: Reflection (0 pts)

**Handwritten Notes (Physics):**

Example Problem  
 $n_1 \sin \theta_1 = n_2 \sin \theta_2$   
 $\theta_1 = \text{critical angle for which total internal reflection occurs}$   
 $\theta_1 = 90^\circ, \sin 90^\circ = 1$   
 $n_2 \sin \theta_2 = n_1$  ( $n_2 > n_1$ )

Calculate the  $\theta_c$  for an interface between 2 media with indices of refraction  
 $n_1 \sin \theta_c = n_2 \sin 90^\circ$   
 $\sin \theta_c = \frac{n_2}{n_1} = \frac{1.0}{1.5}$   
 $\theta_c = \sin^{-1}(\frac{1}{1.5})$

$\cos^2 \theta_c = 1 - \sin^2 \theta_c = 1 - \frac{1}{2.25}$   
 $\cos \theta_c = \sqrt{1 - \frac{1}{2.25}} = \sqrt{\frac{1.25}{2.25}} = \sqrt{\frac{5}{9}} = \frac{\sqrt{5}}{3}$

$n_1 \sin \theta = n_2 \sin \theta$   
 $1 \sin \theta = 1.5 \sin (90 - \theta)$   
 $\sin \theta = 1.5 \cos \theta$   
 $\theta = \tan^{-1}(\frac{1.5}{1}) = \tan^{-1}(1.5)$   
 $\theta = \sin^{-1}(\frac{1.5}{\sqrt{1+1.5^2}})$   
 $\theta = \sin^{-1}(\frac{1.5}{\sqrt{3.25}})$   
 $\theta = 1.1071$

**Diagram:** A diagram showing a light ray incident on a boundary between two media. The incident ray is at angle  $\theta_1$  to the normal. The refracted ray is at angle  $\theta_2$  to the normal. The critical angle  $\theta_c$  is marked where the refracted ray is at  $90^\circ$ .





# Does it work?

**1** pandemic lessons

## Doubling of...

- content learning gains
- physics self-efficacy gains

*Research Shows Students Falling Months Behind During Virus Disruptions*

The abrupt switch to remote learning wiped out academic gains for many students in America, and widened racial and economic



# What do students say?

## *Research Shows Students Falling Months Behind During Virus Disruptions*

The abrupt switch to remote learning wiped out academic gains for many students in America, and widened racial and economic gaps. It won't be easy.



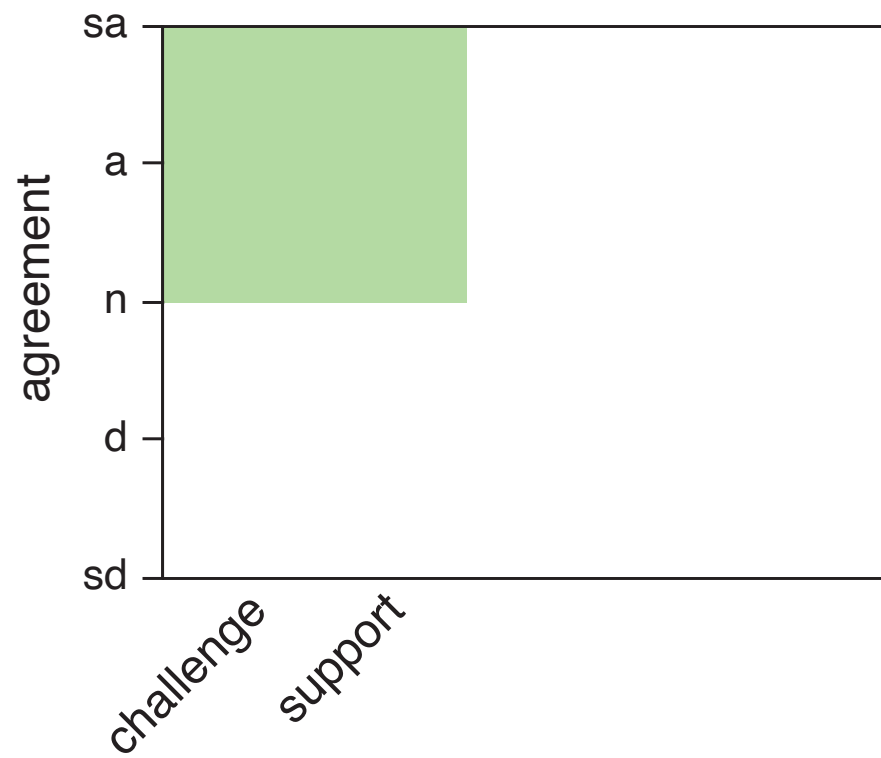
# **Agile Feedback Survey (Talbert)**

- 1. I was challenged intellectually**
- 2. I had plenty of support**
- 3. I am closer to mastering the ideas of the course now**
- 4. I made progress because of my own efforts and choices**
- 5. I felt I was part of a community of learners**

# challenge vs. support

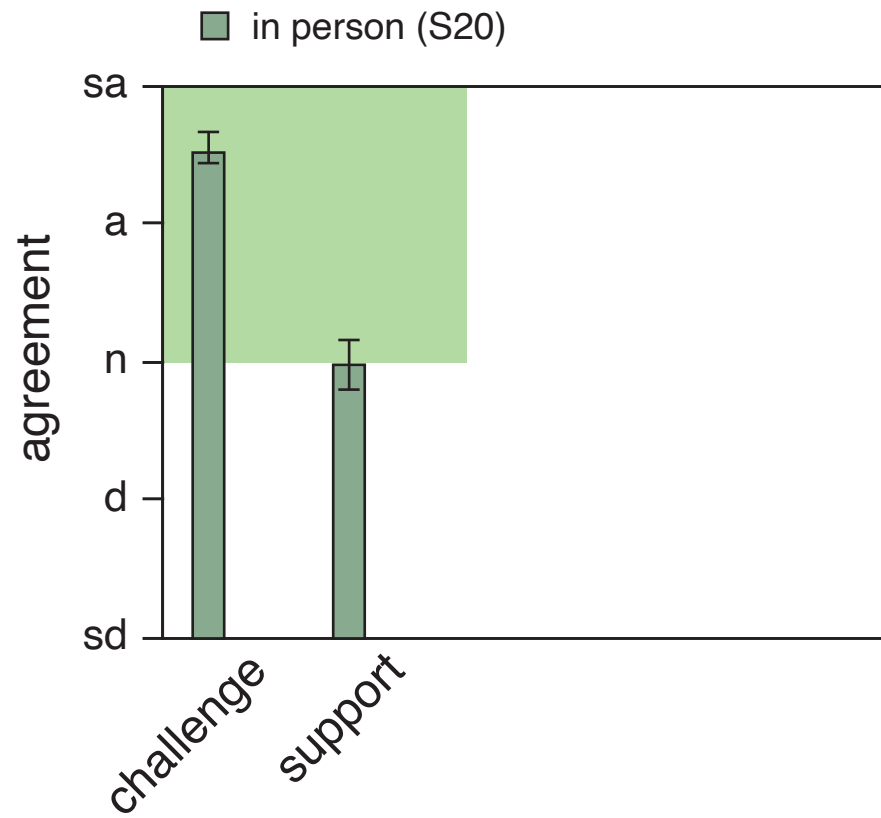
- 1. I was challenged intellectually**
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# challenge vs. support

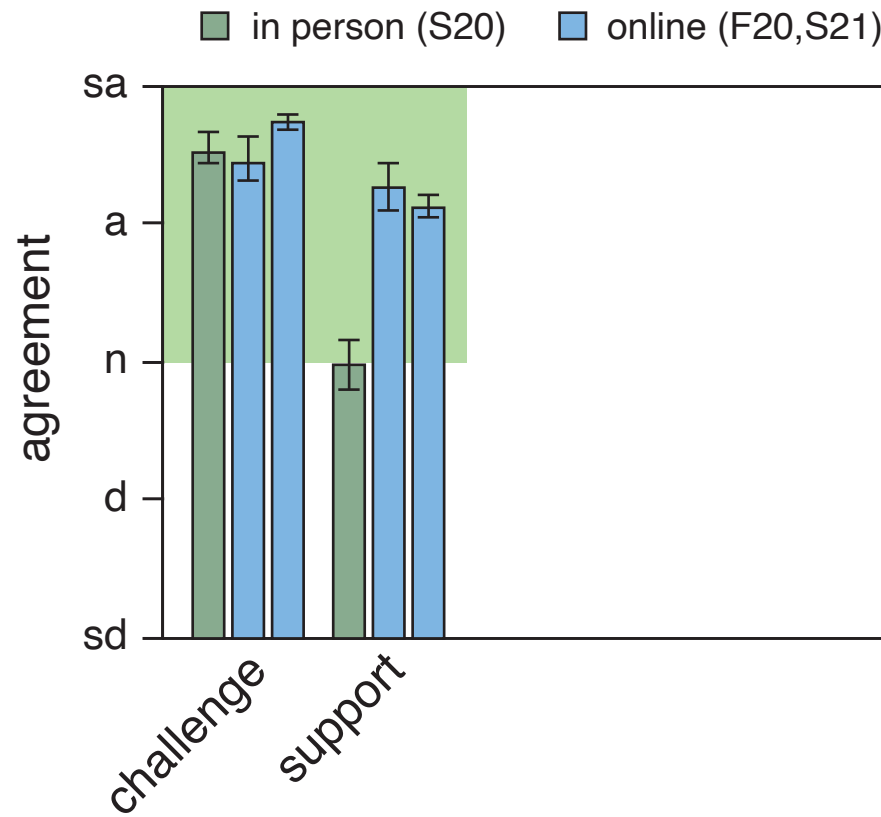




# challenge vs. support



# challenge vs. support





# self-determination

1. I was challenged intellectually (challenge)

2. I had plenty of support (support)

3. I am closer to mastering the ideas of the course now (growth)

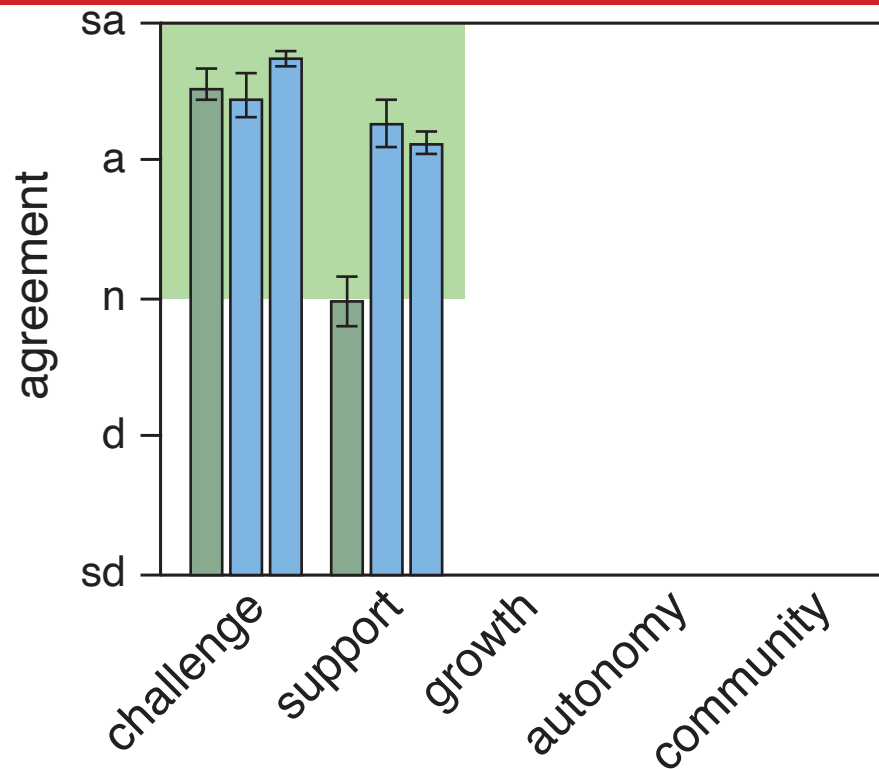
4. I made progress because of my own efforts and choices (auton.)

5. I felt I was part of a community of learners (relatedness)

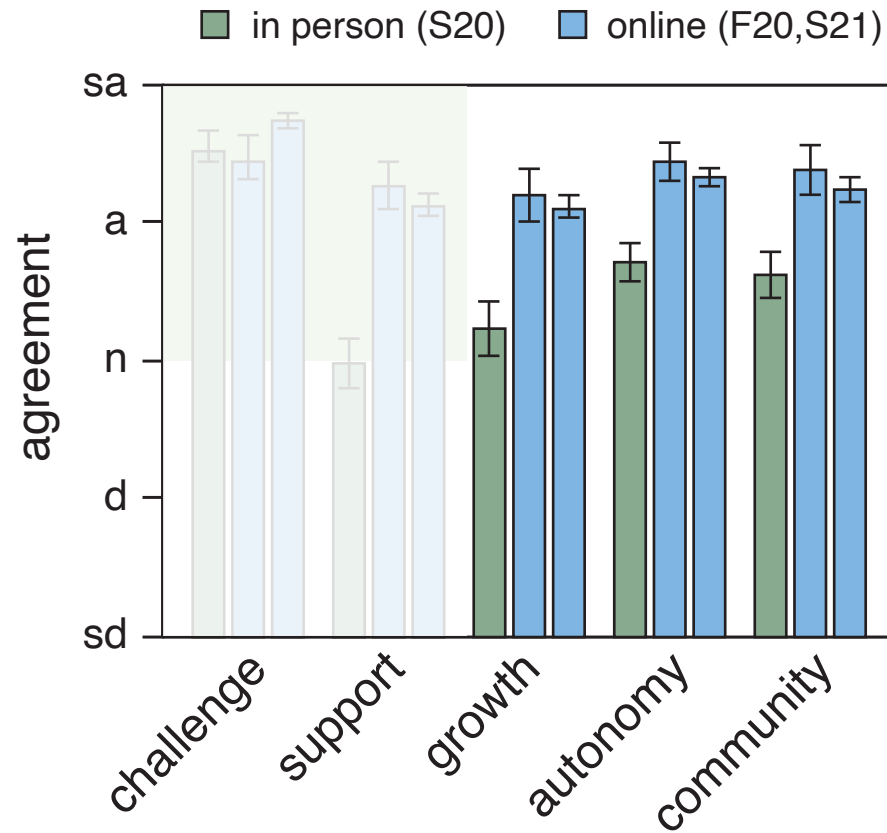


**self-determination**

**What do you predict?**



# self-determination





**I did my best teaching *ever* online!**





**1** pandemic lessons      **2** new normal

A group of people in a modern office setting, working on laptops and discussing projects. The image is semi-transparent, serving as a background for the text.

# weekly workflow

**1** pandemic lessons

**2** new normal



# weekly workflow

content module

practical work

**1** pandemic lessons

**2** new normal



# weekly workflow

content module

practical work

reading

**1** pandemic lessons

**2** new normal

# weekly workflow

**content module**

reading

readiness assurance

**practical work**

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

## practical work

**1** pandemic lessons

**2** new normal



# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**1** pandemic lessons

**2** new normal



# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**replaces lectures**

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**replaces lectures**

**using a social learning platform**

**1** pandemic lessons

**2** new normal



## weekly workflow

content module

reading

readiness assurance

tutorial

challenge

practical work

skills session

project work

**replaces lectures**

**using a social learning platform**

# Perusall

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**strengthen basic knowledge**

**1** pandemic lessons

**2** new normal



# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**strengthen basic knowledge  
through self-paced Peer Instruction**

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

# resolve common misconceptions

**1** pandemic lessons

**2** new normal



# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**1** pandemic lessons

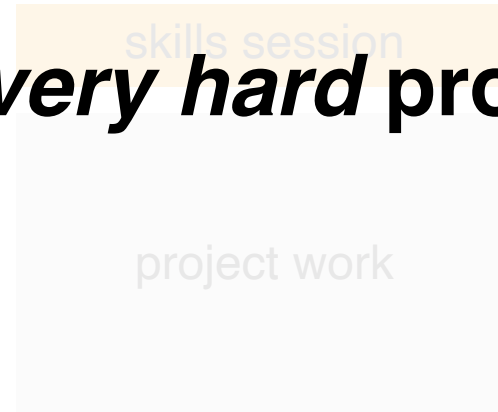
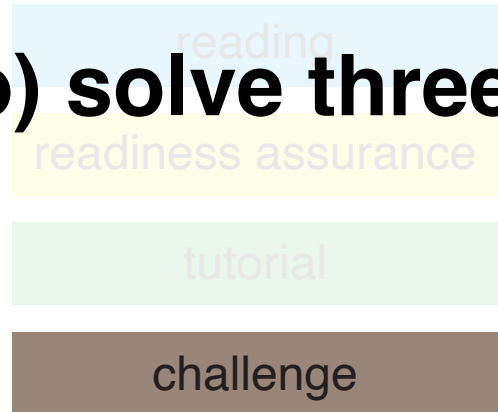
**2** new normal

# weekly workflow

**(try to) solve three *very hard* problems**

content module

practical work



**1** pandemic lessons

**2** new normal

# weekly workflow

content module

practical work

(try to) solve three *very hard* problems  
(and reflect on your work)

reading  
readiness assurance  
tutorial

skills session  
project work

challenge

1 pandemic lessons

2 new normal



# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

**develop relevant skills**

challenge

## practical work

skills session

project work

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

**develop relevant skills**

challenge

## practical work

skills session

project work

**(team work, taking data, building circuits, etc.)**

**1** pandemic lessons

**2** new normal



# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**3 month-long projects per semester (six total)**

**1** pandemic lessons

**2** new normal

# weekly workflow

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**3 month-long projects per semester (six total)**  
**new team for each project**

**1** pandemic lessons

**2** new normal





**classrooms are a constraint**

**1** pandemic lessons

**2** new normal

InnoBreakCafe

# learning space

## content module

reading

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**1** pandemic lessons

**2** new normal

InnoBreakCafe

# learning space

## content module

reading  
**ONLINE**

readiness assurance

tutorial

challenge

## practical work

skills session

project work

**1** pandemic lessons

**2** new normal



InnoBreakCafe

# learning space

## content module

reading

**ONLINE**

readiness assurance

tutorial

challenge

**FLEX SPACE**

## practical work

skills session

project work

**1** pandemic lessons

**2** new normal

InnoBreakCafe

# learning space

## content module

reading

**ONLINE**

readiness assurance

tutorial

challenge

**FLEX SPACE**

## practical work

skills session

project work

**MAKERSPACE**

**1** pandemic lessons

**2** new normal

InnoBreakCafe

# learning space

## content module

reading

**ONLINE**

readiness assurance

tutorial

challenge

**FLEX SPACE**

## practical work

skills session

project work

**MAKERSPACE**

9:45

**Tuesday**

11:00

11:15

12:30

9:45

**Thursday**

11:00

11:15

12:30

**1** pandemic lessons

**2** new normal



InnoBreakCafe

# learning space

## COHORTS

A B C D

9:45

### content module

### practical work

reading

**ONLINE**

readiness assurance

skills session

tutorial

challenge

project work

**FLEX SPACE**

**MAKERSPACE**

**Tuesday**

11:00

11:15

12:30

9:45

**Thursday**

11:00

11:15

12:30

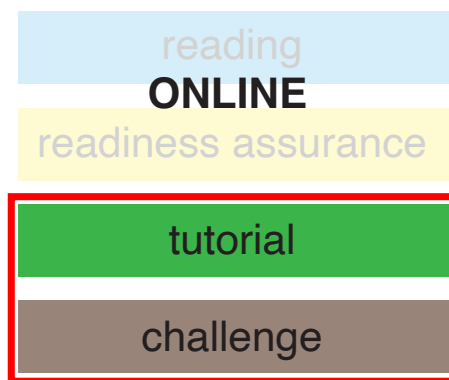
**1** pandemic lessons

**2** new normal

InnoBreakCafe

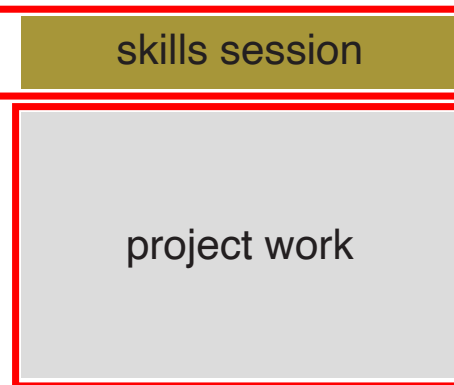
# learning space

## content module



**FLEX SPACE**

## practical work



**MAKERSPACE**

## COHORTS

	A	B	C	D
Tuesday	9:45			
Thursday	9:45			

	A	B	C	D
Tuesday	9:45			
Thursday	9:45			

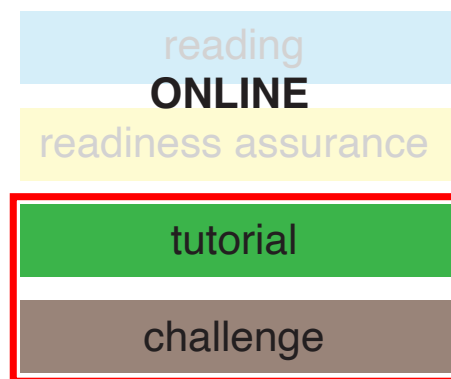
**1** pandemic lessons

**2** new normal

InnoBreakCafe

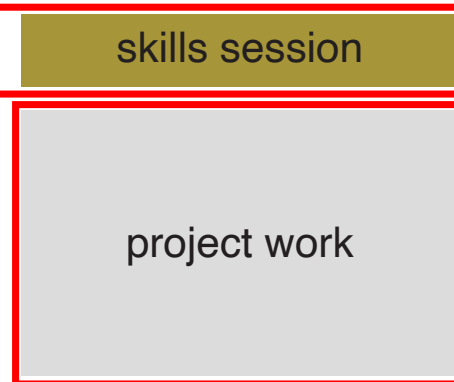
# learning space

## content module



## FLEX SPACE

## practical work



## MAKERSPACE

## COHORTS

	A	B	C	D
Tuesday	9:45	Team Review of Tutorial LL2.229	Project A.L.L	Skills LL2.223
	11:00			
	11:15	Project A.L.L	Skills LL2.223	Team Review of Tutorial LL2.229
	12:30			
Thursday	9:45	Team Review of Challenge LL2.229	Skills LL2.223	Project A.L.L
	11:00			
	11:15	Skills LL2.223	Project A.L.L	Team Review of Challenge LL2.229
	12:30			

1 pandemic lessons

2 new normal





**1** pandemic lessons      **2** new normal





**“breaking down classroom walls”**

**1 pandemic lessons**

**2 new normal**



# the new (not so) normal



**1** pandemic lessons

**2** new normal



# the new (not so) normal

- no lectures

**1** pandemic lessons

**2** new normal



# the new (not so) normal

- no lectures
- no exams

**1** pandemic lessons

**2** new normal



# the new (not so) normal

- no lectures
- no exams
- no (fixed) classroom

**1** pandemic lessons

**2** new normal



# the new (not so) normal

- no lectures
- no exams
- no (fixed) classroom
- no (fixed) start or end time

**1** pandemic lessons

**2** new normal



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