

# Breaking down the classroom walls: Engaging student teams across time and space



ENLIGHT Teaching and Learning Conference  
University of Ghent  
Gent, Belgium, 18 November 2021



# Breaking down the classroom walls: Engaging student teams across time and space



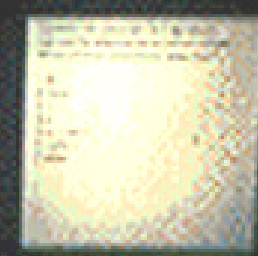
@eric\_mazur

ENLIGHT Teaching and Learning Conference  
University of Ghent  
Gent, Belgium, 18 November 2021



1. The first step in the process of...  
2. The second step is to...  
3. The third step is to...  
4. The fourth step is to...  
5. The fifth step is to...

1. The first step in the process of...  
2. The second step is to...  
3. The third step is to...  
4. The fourth step is to...  
5. The fifth step is to...



1. The first step in the process of...  
2. The second step is to...  
3. The third step is to...  
4. The fourth step is to...  
5. The fifth step is to...

1. The first step in the process of...  
2. The second step is to...  
3. The third step is to...  
4. The fourth step is to...  
5. The fifth step is to...

1. The first step in the process of...  
2. The second step is to...  
3. The third step is to...  
4. The fourth step is to...  
5. The fifth step is to...







# March 2020

# AP50

1 before (and just after) pandemic





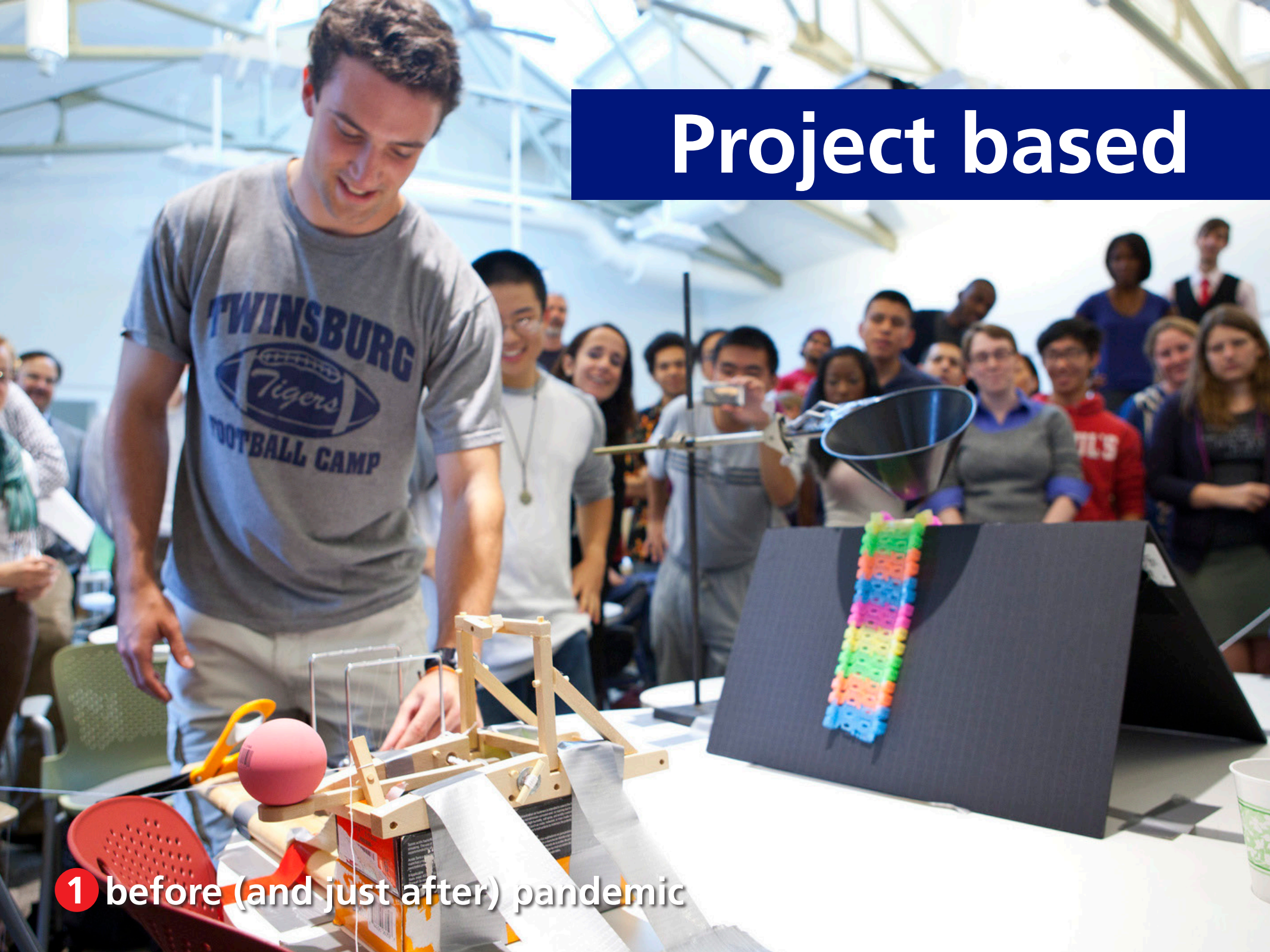
# Team based

**1** before (and just after) pandemic



# Project based

1 before (and just after) pandemic







# Intrinsic motivation


1 before (and just after) pandemic





1 before (and just after) pandemic





*no lectures*

*no exams*

① before (and just after) pandemic



# blend of 6 scaffolded “best practices”

understand

## LC: Learning Catalytics

90 min



Instructor poses question  
Answer alone  
Discuss in team  
Answer again



## Tutorial

60 min



Work on worksheet with team  
Explore concepts  
Discuss with staff

apply

## EA: Estimation Activity

30 min



Estimate quantities  
Develop individual strategy  
Discuss and solve as team

## EDA: Experimental Design Activity

90 min



Conduct experiment with team  
Take measurements  
Analyze data  
Carry out simulations



evaluate

## Problem Set & Reflection

90 min



Work problems alone BEFORE class  
Discuss with team, mark up  
Self-assess & turn in

## RAA: Readiness Assurance Activity

90 min



Part 1: solve problems alone  
Open book, open internet  
Part 2: solve with team



1 before (and just after) pandemic



A group of four students are gathered around a wooden box containing a project. A female student with glasses is pouring liquid from a white cup into a grey tube. Another female student is smiling and looking at the project. A male student in a plaid shirt is standing and smiling. A female student in a maroon hoodie is sitting and smiling. The box contains various components, including a blue bowl, a white cup, and a circuit board with many small components. The background shows a classroom or lab setting with other students and equipment.

[bit.ly/ap50class](https://bit.ly/ap50class)

**1** before (and just after) pandemic





March 13, 2020

1 before (and just after) pandemic





**instructional continuity between first and second half?**

**1** before (and just after) pandemic





**instructional continuity between first and second half?**

**86% agreed**

**1** before (and just after) pandemic





**Summer 2020**



# Moving online

***"How can I transfer online what I do in the classroom?"***



# Moving online

***"How can I transfer online what I do in the classroom?"  
(challenge)***



# Moving online

***"How can I transfer online what I do in the classroom?"  
(challenge)***



# Moving online

***"How can I transfer online what I do in the classroom?"***  
(challenge)

***"What can I do online that I cannot do in the classroom?"***  
(opportunity)

## **Changes implemented**

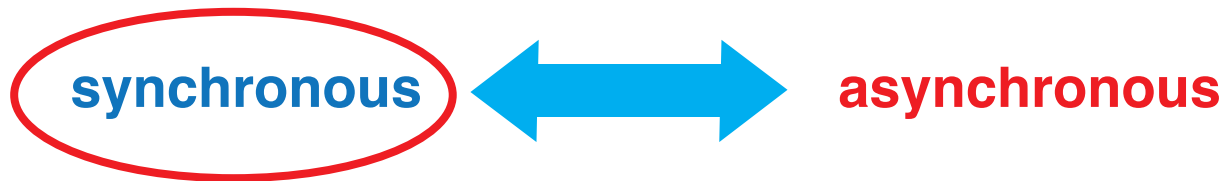
- **Minimize sync/instructor-paced**
- **Personalize instruction**



# Minimize sync/instructor-paced

synchronous ↔ asynchronous

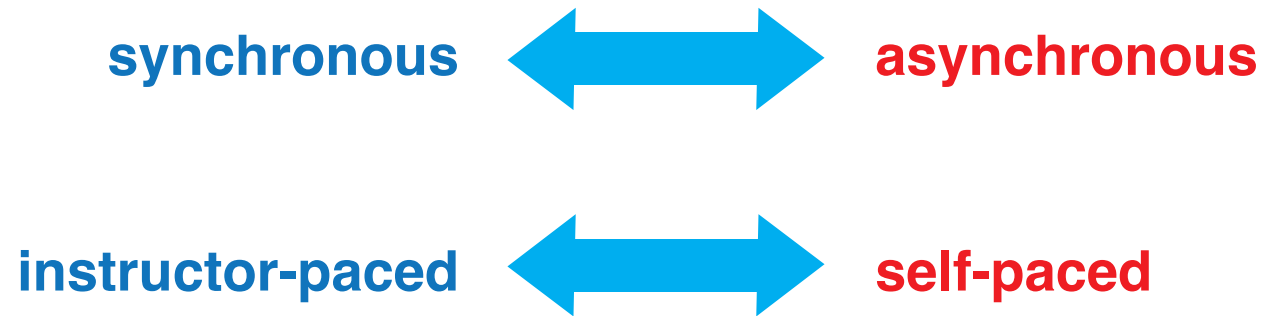
# Minimize sync/instructor-paced



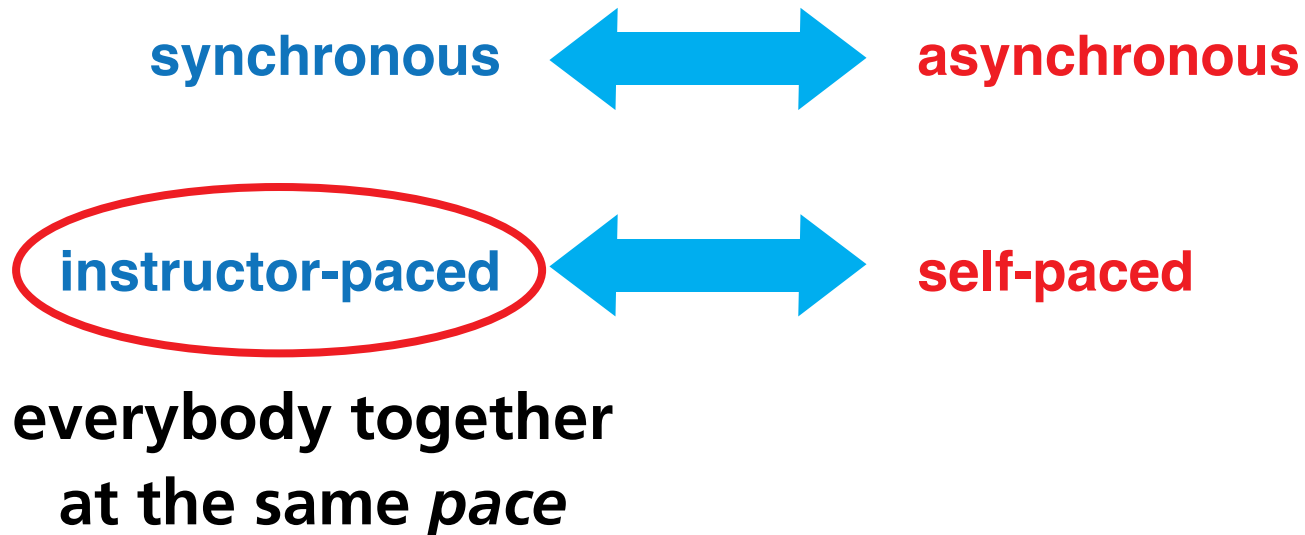
everybody together  
at the same *time*



# Minimize sync/instructor-paced

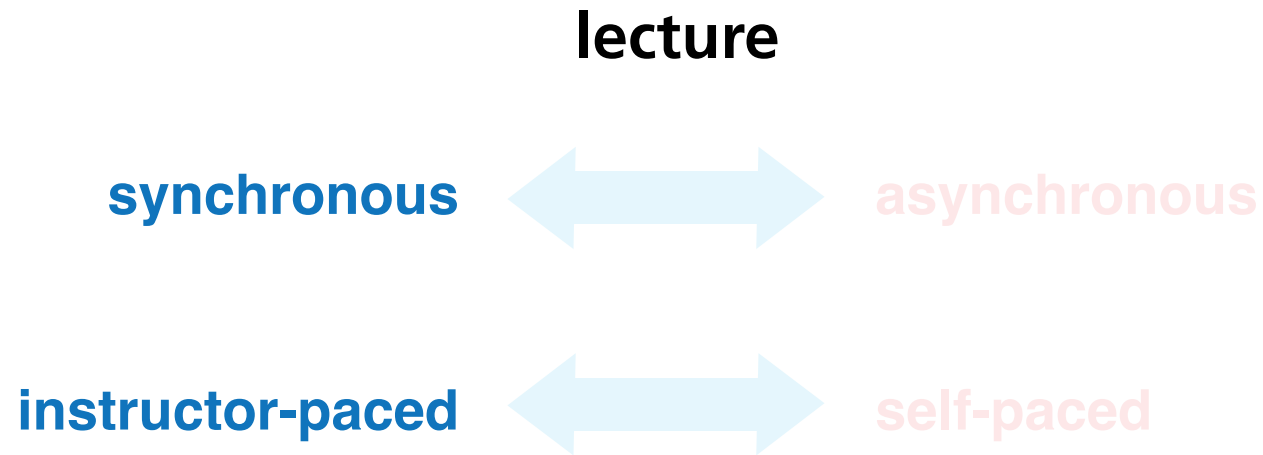


# Minimize sync/instructor-paced





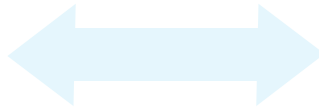
# Minimize sync/instructor-paced



# Minimize sync/instructor-paced

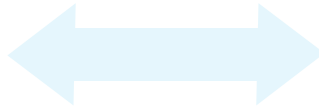
recorded lecture

synchronous



asynchronous

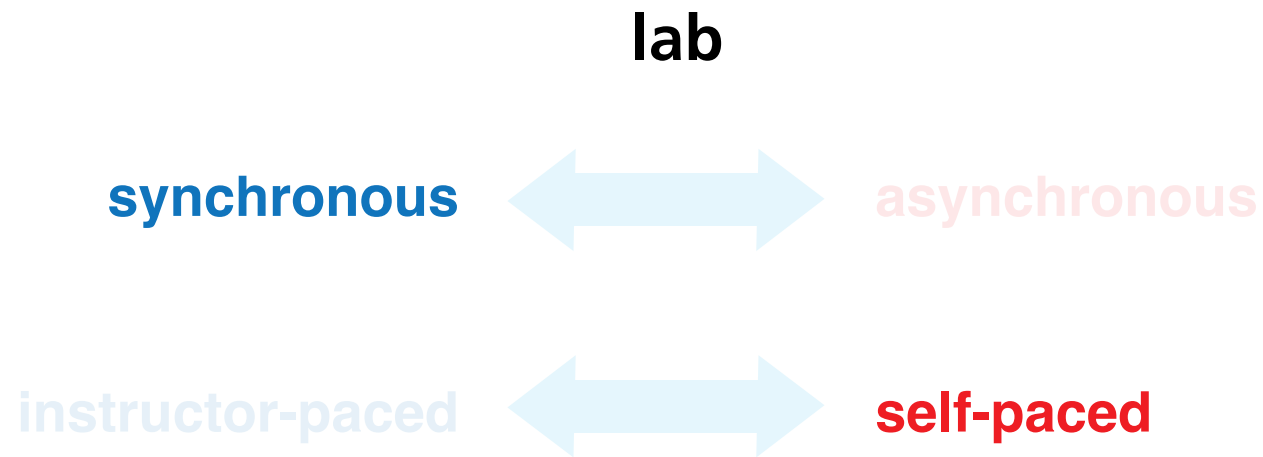
instructor-paced



self-paced



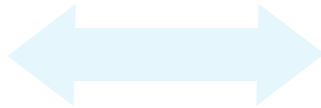
# Minimize sync/instructor-paced



# Minimize sync/instructor-paced

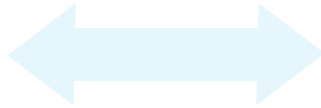
homework/study

synchronous



asynchronous

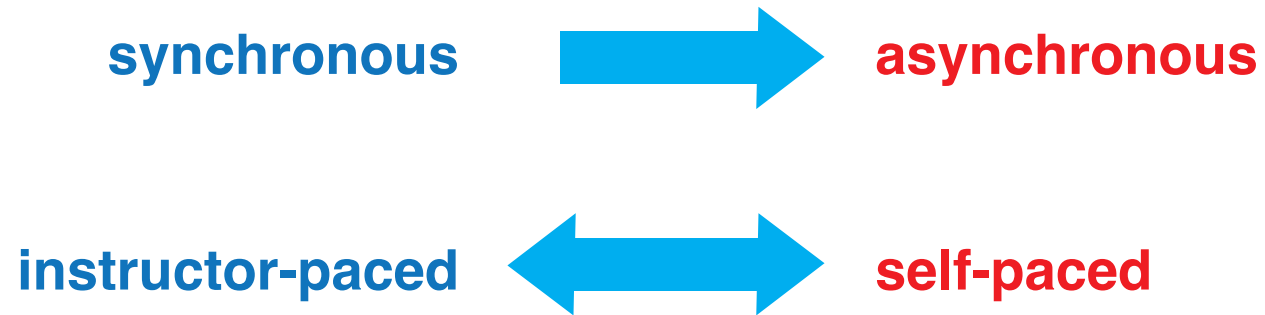
instructor-paced



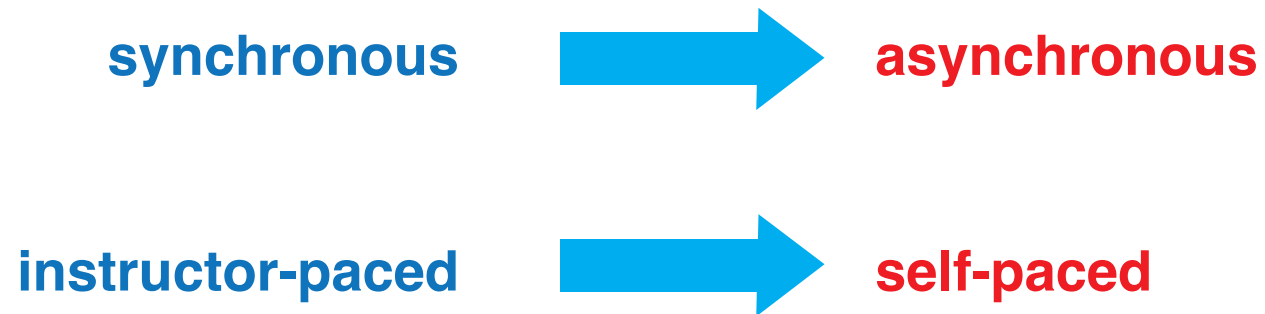
self-paced



# Minimize sync/instructor-paced

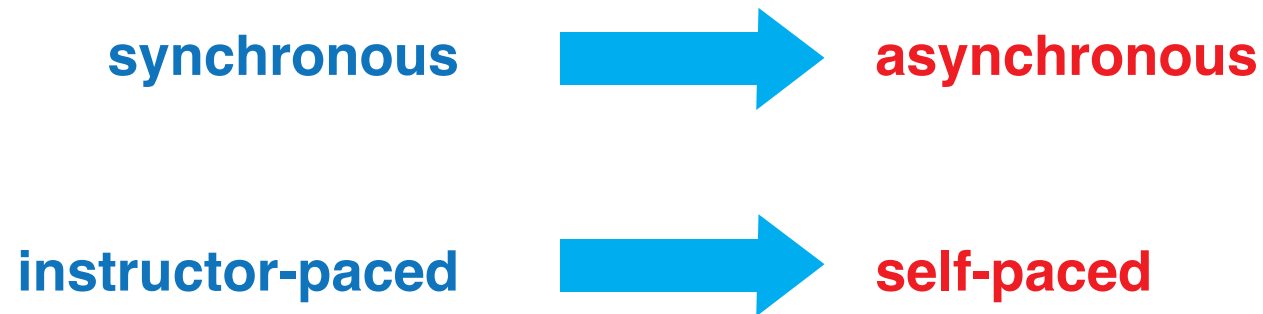


# Minimize sync/instructor-paced





# Minimize sync/instructor-paced



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

A background image of a modern classroom or meeting space. Several students are seated around a large white circular table, working on laptops. One student in the foreground is looking at a laptop screen displaying a data visualization. Other students are in the background, some standing and talking. The scene is brightly lit with large windows in the background.

**Personalize instruction**

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



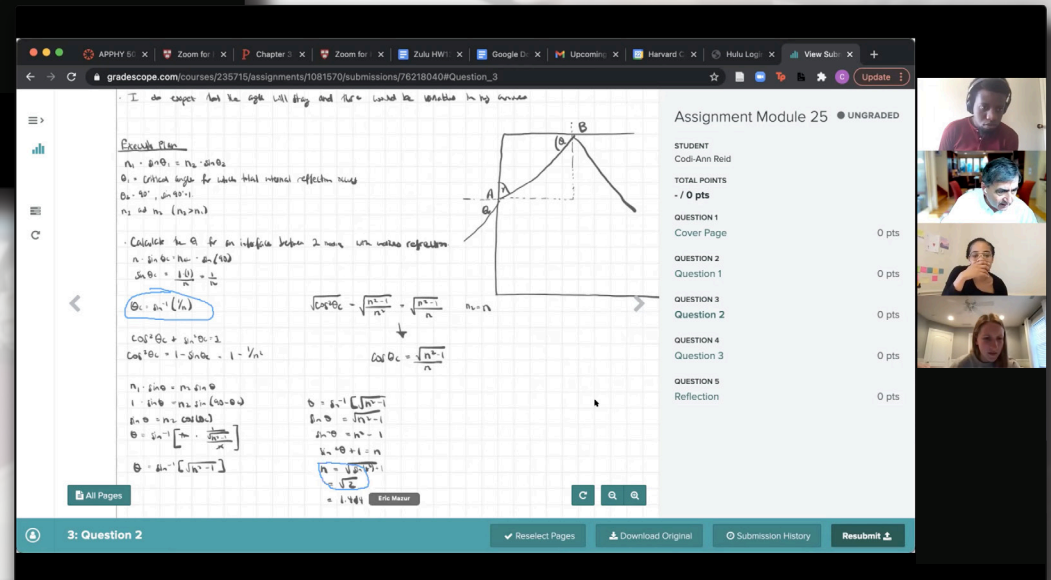
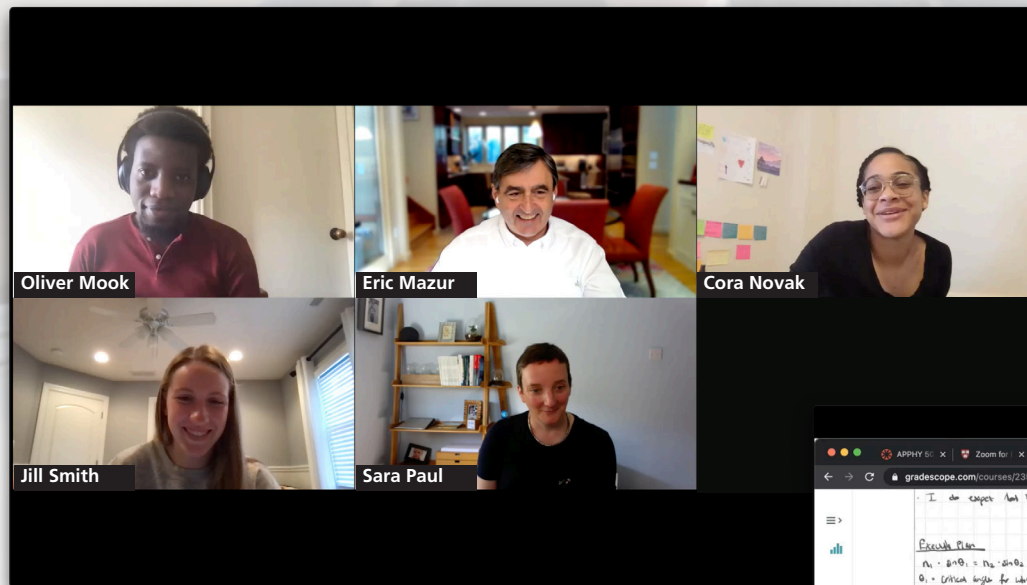
# **Personalize instruction**

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

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

# Personalize instruction

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)

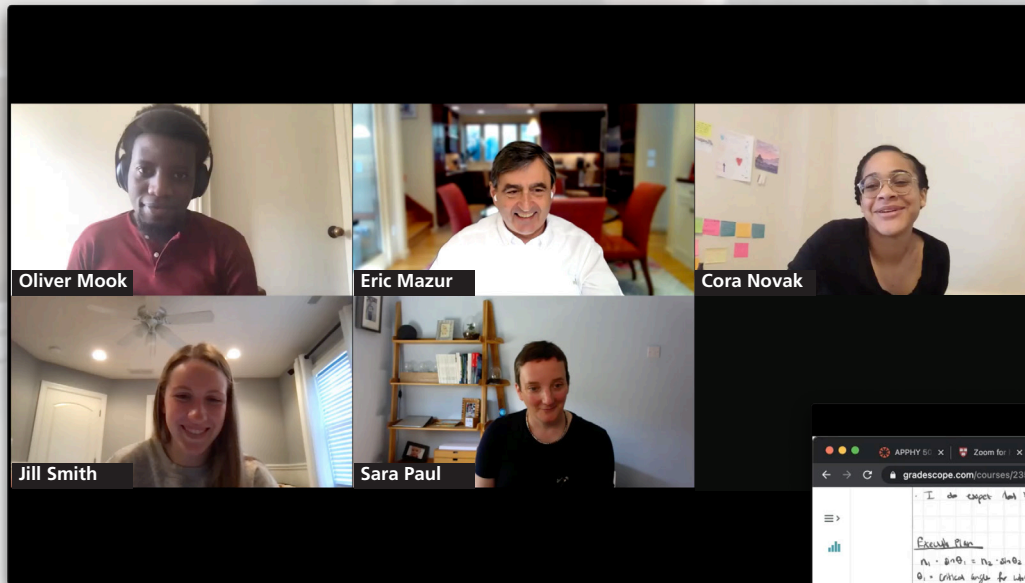
3: Question 2

Reselect Pages Download Original Submission History Resubmit



# Personalize instruction

## every student on front row



The screenshot shows a Gradescope assignment page for "Assignment Module 25" (UNGRADED). The page displays a physics problem involving light rays and refraction, with handwritten solutions and diagrams. The problem text includes:

"I do expect that the light will bend and that could be whether it's curved"

Example 1:

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

Calculate the  $\theta_c$  for an interface between 2 media with various refractive indices.

$n_1 \sin \theta_c = n_2 \sin 90^\circ$   
 $\sin \theta_c = \frac{n_2}{n_1}$   
 $\theta_c = \sin^{-1}(\frac{n_2}{n_1})$

$\cos^2 \theta_c = 1 - \sin^2 \theta_c = 1 - \frac{n_2^2}{n_1^2}$   
 $\cos \theta_c = \sqrt{1 - \frac{n_2^2}{n_1^2}}$

$n_1 \sin \theta_c = n_2 \sin 90^\circ$   
 $1 \cdot \sin \theta_c = n_2 \sin 90^\circ$   
 $\sin \theta_c = n_2 \sin 90^\circ$   
 $\theta_c = \sin^{-1}(\frac{n_2}{n_1})$   
 $\theta_c = \sin^{-1}(\frac{1.5}{1.741})$   
 $\theta_c = 59.5^\circ$

The page also shows a sidebar with a list of questions and their scores:

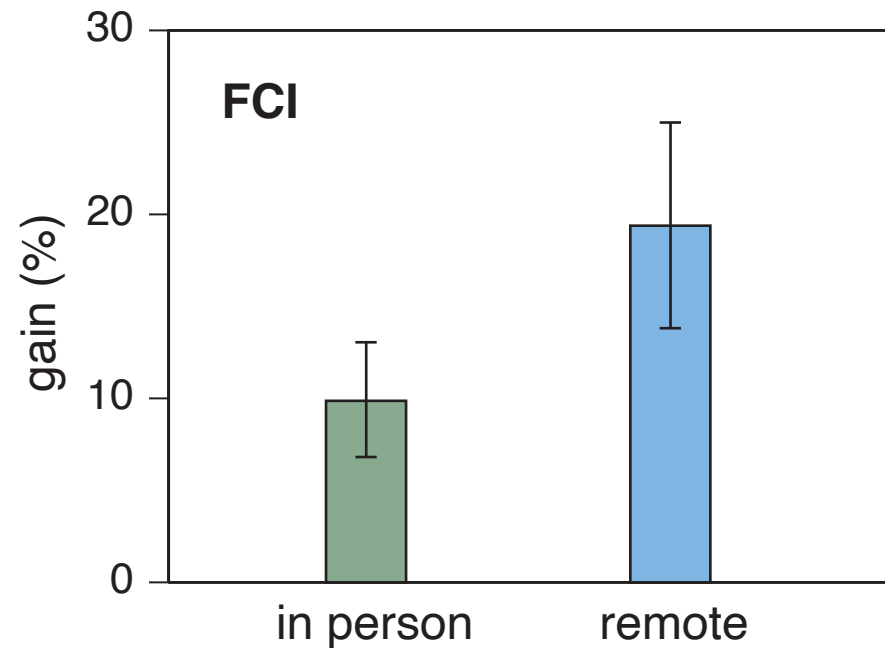
- QUESTION 1: Cover Page (0 pts)
- QUESTION 2: Question 1 (0 pts)
- QUESTION 3: Question 2 (0 pts)
- QUESTION 4: Question 3 (0 pts)
- QUESTION 5: Reflection (0 pts)

## **Changes implemented**

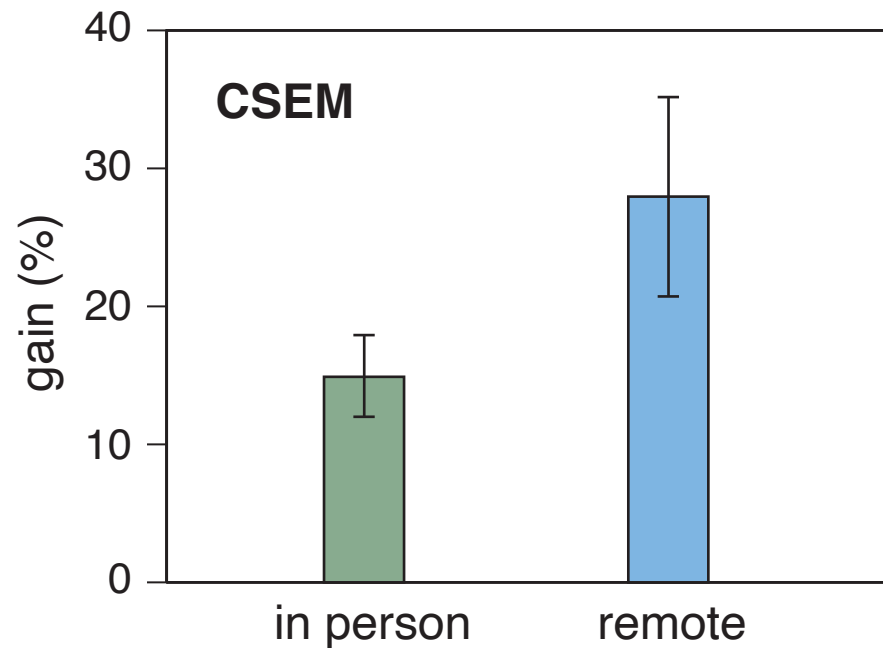
- **Minimize sync/instructor-paced**
- **Personalize instruction**
- **Specifications Grading**



# Fall Content Learning Gain



# Spring Content Learning Gain





# Self Efficacy

**belief in ability to succeed in a certain domain**

## 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 gaps. Catching up in the fall won't be easy.



## Improved

- sense of growth and autonomy
- sense of support and community
- course evaluation



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

## *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. Catching up in the fall won't be easy.

**3** results



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

**So, now what?**





Revert back?

# (Post?) Pandemic changes

## Sections — in person or online (same experience, either way!)

You and your team can decide not only when, but also how to participate in the regular weekly class meetings for AP50. You can meet with your team and the TFs and me in the classroom (Pierce Hall 301), during one of the two section times. Alternatively, you can meet with us via Zoom, ideally during those same time slots.



**In person:** You and your teammates will be seated around a table in Pierce Hall 301 and share your work with each other using Zoom. Members of the teaching staff will check in with you at the table. (**Note:** Unlike in the picture, face coverings are **mandatory** in the classroom.)



**Online:** You and your teammates will meet in your team's Zoom meeting room and communicate and share your work with each other using Zoom. Members of the teaching staff will check in with you in your team's Zoom room.

## Multimodal approach

No matter how you participate, the experience will be the same, as we carry out all class activities on the same platforms in person and online. On Zoom, your team will meet in its own Zoom room and you will share your work with each other via Zoom. In the in-person classroom your team will be seated at a table and also use Zoom to share work, but of course you'll need to use a camera or microphone — you can just talk to each other. In both cases, whenever your team is ready to have its work validated by the teaching staff or if you have a question, you will notify us on Slack and one of us will visit your Zoom room or come to your table in person. **Note:** Face coverings are **mandatory** for all in-person meetings (see below for additional details).

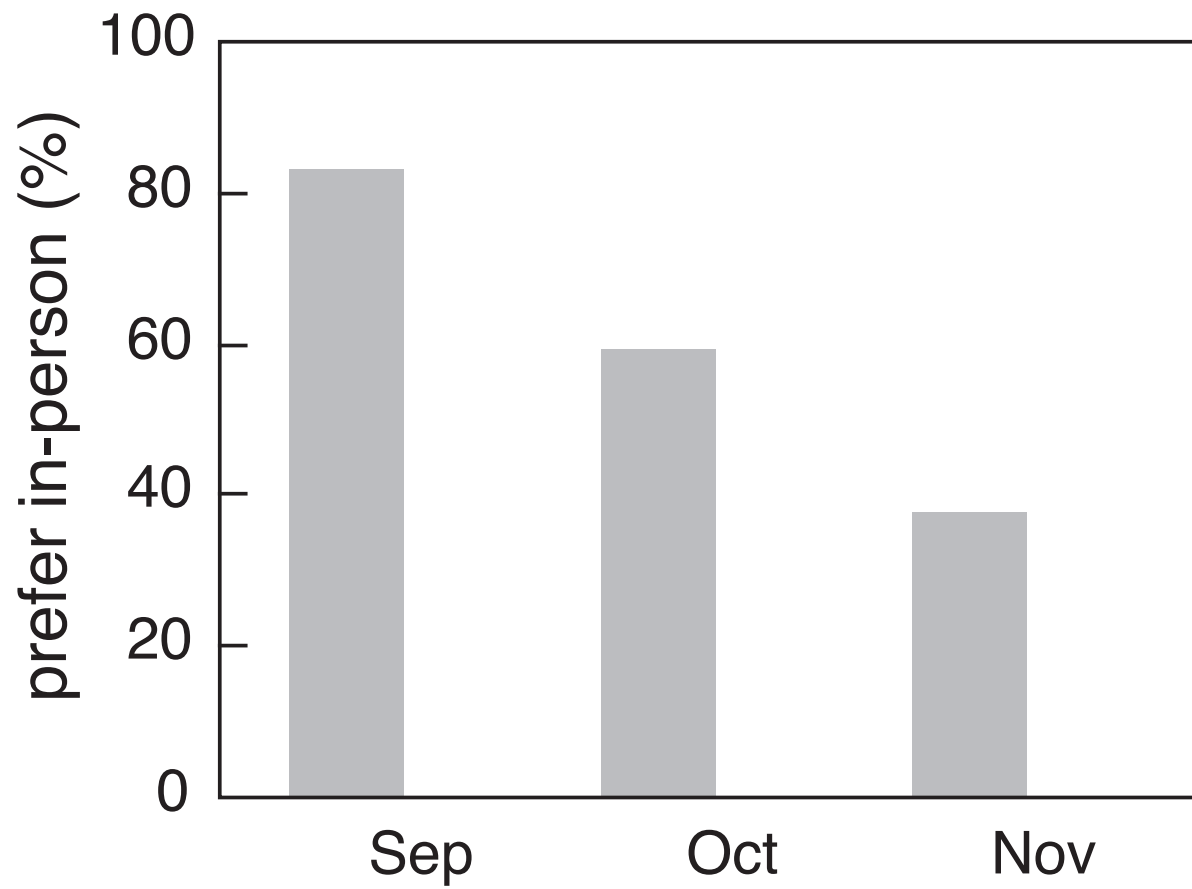
You **don't need to commit to in-person or online in advance**, and you can switch back and forth as you please, **provided the entire team agrees to participate at the same time and in the same modality for a given activity** (all in-person or all online). To facilitate that process, we will ask you for your preferences before we form teams and match you with people who have similar preferences.

## Sections — Logistics

...in Pierce Hall 301. If you participate online, begin your section by going to the [AP50 Teaching Team Room](#) on Zoom. All ... the AP50 Teaching Team Room on ...

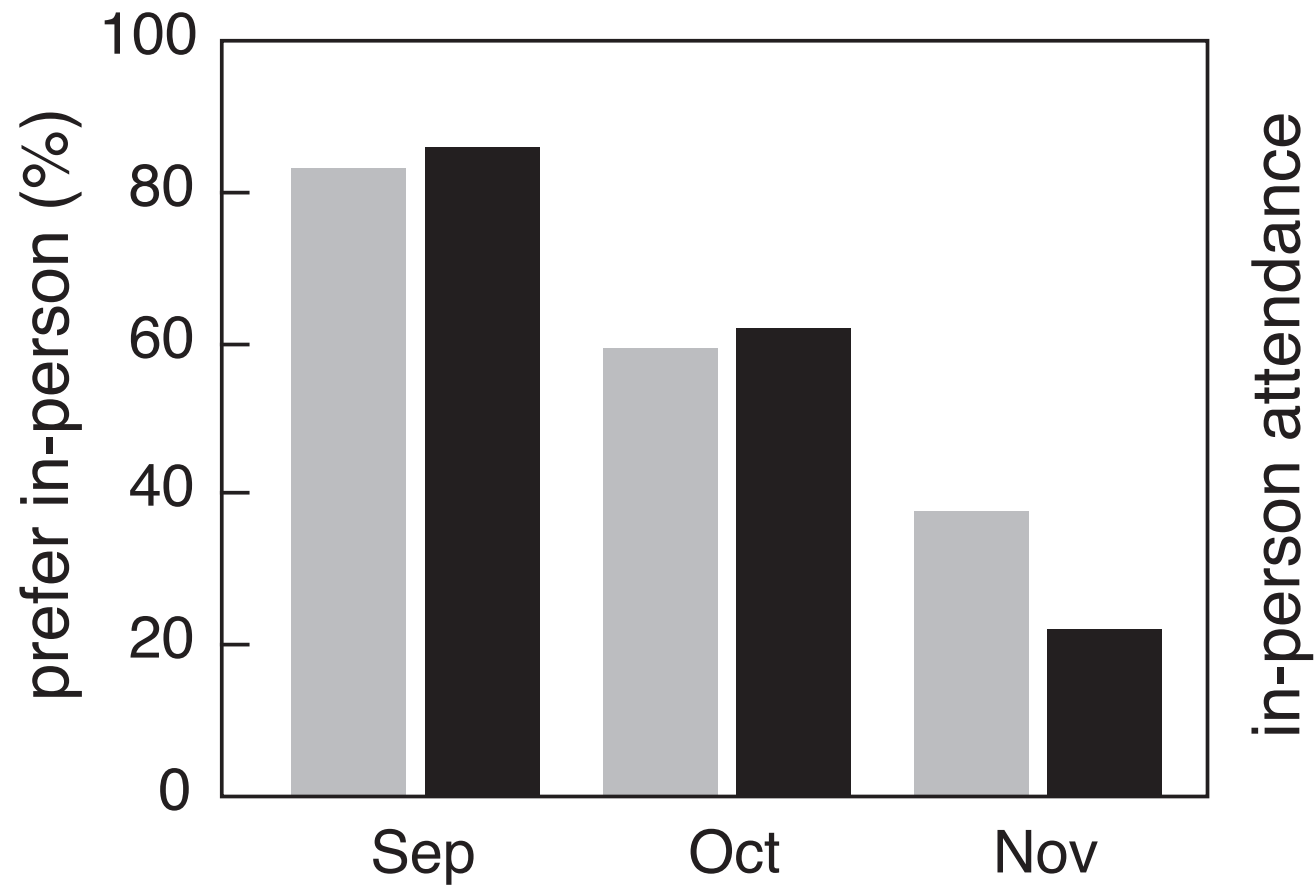


# in-person vs. remote





# in-person vs. remote



Weekend long reads



© Graziano Pantili

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.





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

pres  
tire

**Remote teaching may well become a fixture of life**

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.



Yuval Noah Harari MARCH 20 2020

Humankind is now facing a global crisis. Perhaps the biggest crisis of our  
eration. The decisions people and governments take in the next few weeks  
ers to come. They will shape not just our  
We must act



**“breaking down classroom walls”**



**for a copy of this presentation:**

**mazur.harvard.edu**

**course Canvas page: [bit.ly/erics\\_course](https://bit.ly/erics_course)**

**Follow me!**



**@eric\_mazur**