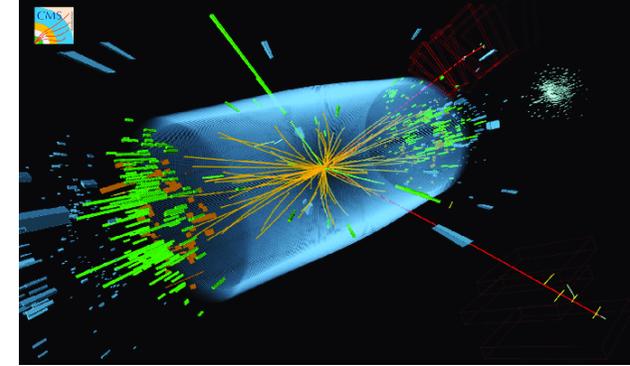


# FIRE: THE FIRST-YEAR INNOVATION & RESEARCH EXPERIENCE

**SIMULATING PARTICLE DETECTION**



## Examples of Collaborative Tools Used During Remote-Learning

**Muge Karagoz, UMD**

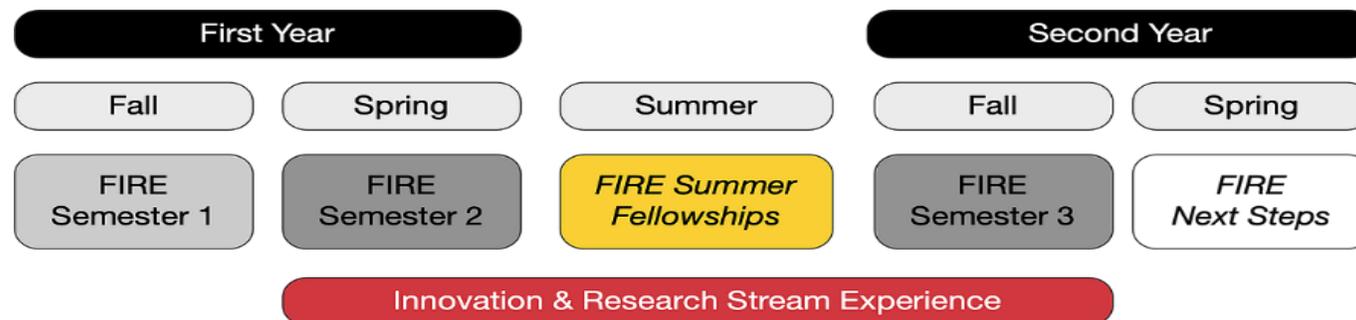
**CSAAPT Virtual Meeting, 4/17/2021**

# Outline

- What I teach?
- Interactive collaborative class tools that I've used during the pandemic
  - Google Jamboard
  - Menti
- Conclusions

# What I teach?

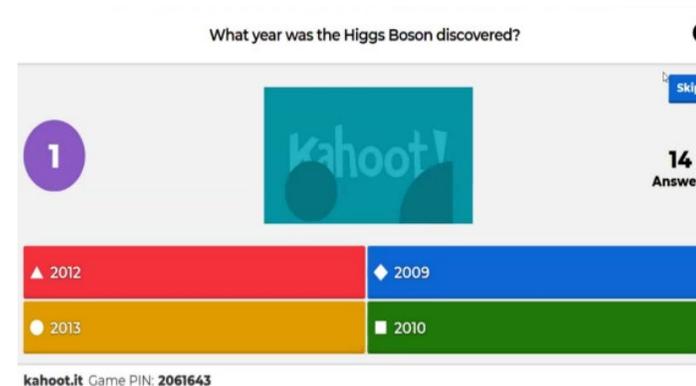
- A curriculum-based research course (“stream”) at UMD as part of the First-Year Innovation & Research Experience (FIRE) program (~15 FIRE streams).
- Each stream is a research group of one leader (Research Educator), 1-2 faculty advisors, ~ 35 students, and up to 15 Peer Research Mentors. Streams have 1 hr lecture and ~4-5 hrs lab time weekly, in a semester.
- My stream SPD (“Simulating Particle Detection”) introduces students to experimental high energy particle physics (HEP), concentrating on computing and data analysis, specifically CMS@CERN’s upgrade simulations.
- I am reasonably autonomous in running my stream’s research and curriculum. I follow a HEP philosophy: training, collaboration, leadership, peer-reviewing, community-building, resource-sharing, and mentoring.
- I find it powerful (and fun) to add active-learning components in my classes.



The 3-semester FIRE gen-ed Program (©FIRE)

# What tools can be used?

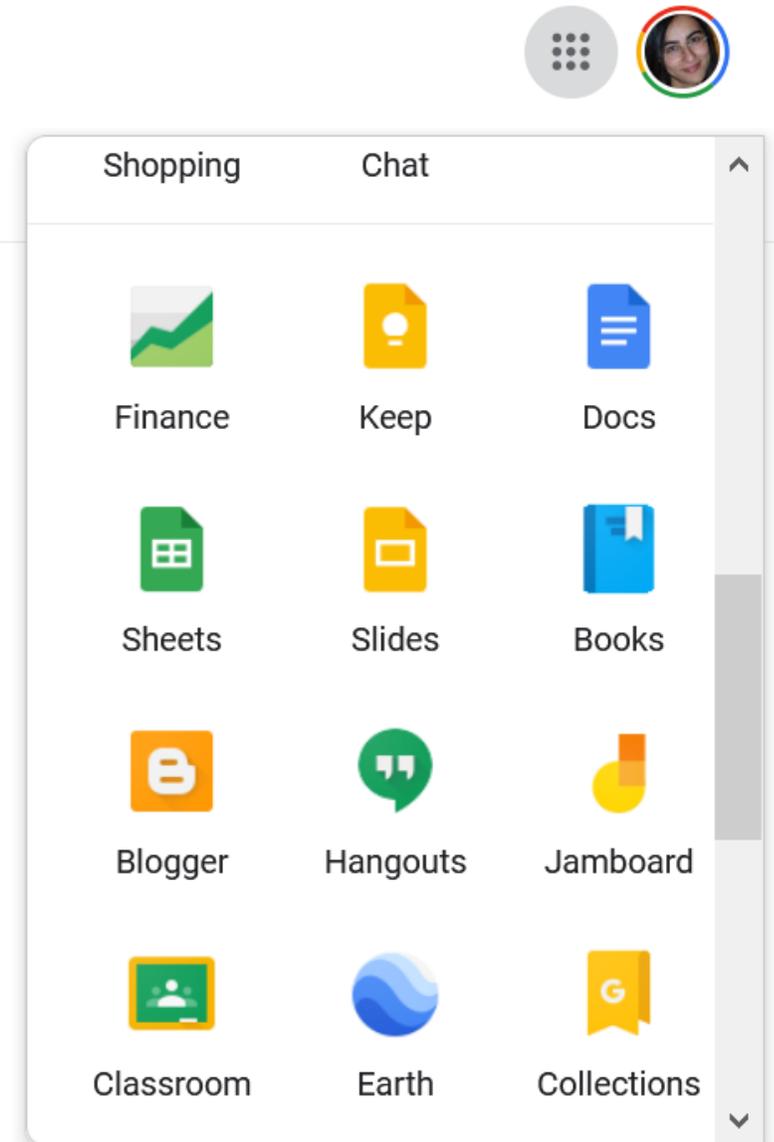
- What pedagogical purposes can tools be used for?
  - Community-building, fun ice-breaking
  - Educational & Research activities
- Being a curriculum-based research course, and a computational technology stream that concentrates on collaborative and research tools, I've utilized many online tools online either in-class or at research setting (Google Suite, GitHub, Overleaf, slack, trello, kahoot!)
- During the pandemic, I started exploring and using tools like Google Jamboard, or menti
- Many others available: poll everywhere, mural, ... All is optimal for different purposes.



In-class and online physics activities also foster community building

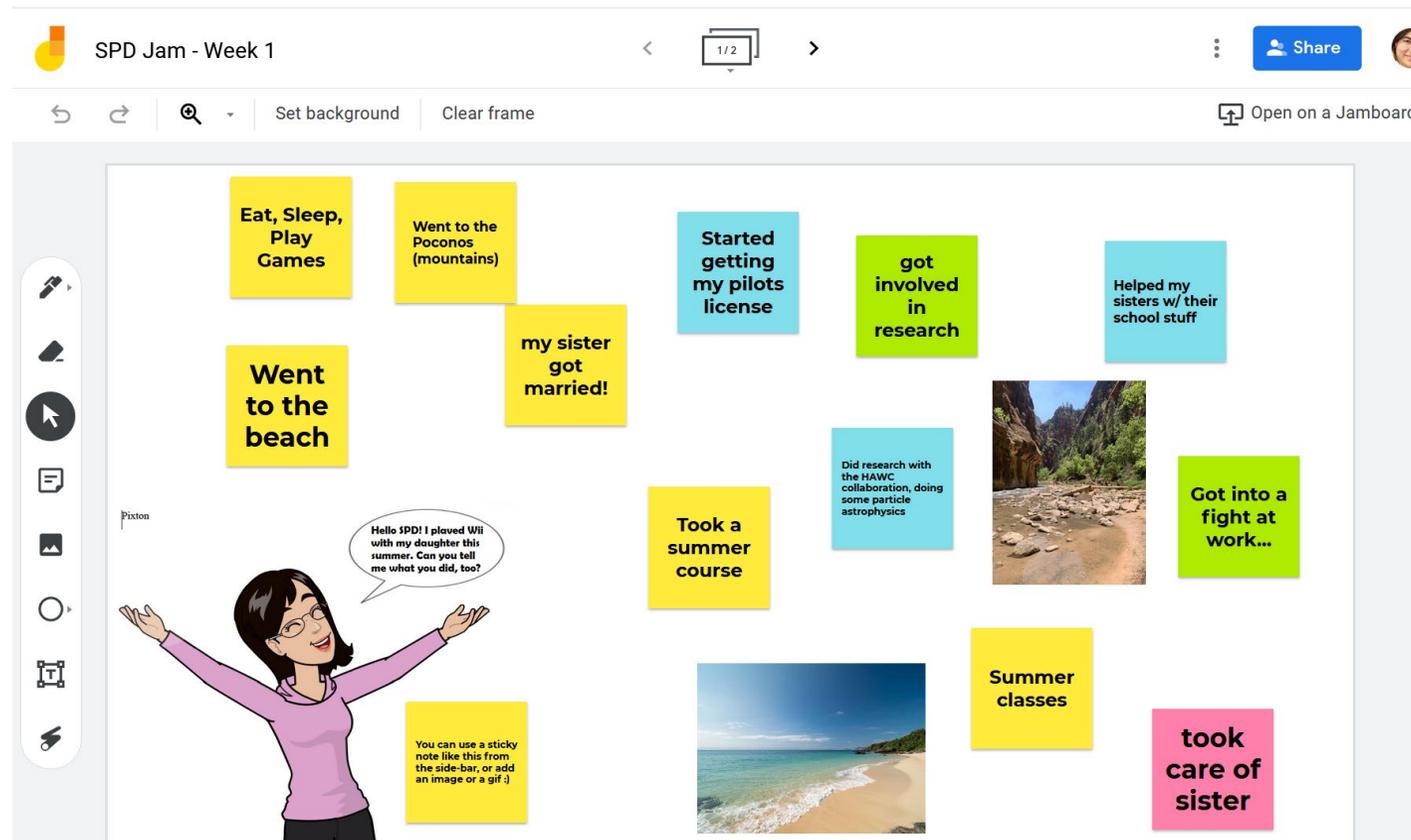
# Tool 1: Google Jamboard

- Jamboard is an online interactive whiteboard tool for collaboration across multiple devices. Available with a G-suite account.
- UMD G-suite for Education gives my students full access to Google tools/apps.
- I use it only online by sharing links on my drive (no physical smartboard)
- Very basic functionality, so easy to use.
- Some cons:
  - Only 25 connections per jamboard. Solutions: Create multiple jamboards per session. Or use google drawing or a google slide for similar functionalities
  - I heard that there is accessibility issues for screen readers. Google slides or drawing would, then again, is an option.



# Example 1: Community Building/Ice-breaking

- Depending on the week's load, in my online classes, I start my zoom session with a fun question for students. As students come in, they "join the conversation".
- For simple use like this, this works seamlessly.



# Example 2: Education – Breakout rooms

- I use jamboards for zoom breakout room sessions for active group learning for my physics topics.
- Depending on the exercise, each group can get their own “jamboard frame” and we may discuss as the whole class once rooms are closed.

Hello SPD! Let's team up and use different color sticky notes to classify and organize elementary particles by their electric charge! Let's also answer what the charge of the proton is using the charges of quarks listed here.

**Standard Model of Elementary Particles**

three generations of matter (fermions)      interactions / force carriers (bosons)

	I			II			III			interactions / force carriers (bosons)	
mass	2.2 MeV/c <sup>2</sup>			1.28 GeV/c <sup>2</sup>			173.1 GeV/c <sup>2</sup>			124.97 GeV/c <sup>2</sup>	
charge	2/3			-1/3			0			0	
spin	1/2			1/2			1/2			0	
<b>QUARKS</b>	u up	c charm	t top	d down	s strange	b bottom	g gluon	H higgs			
<b>LEPTONS</b>	e electron	μ muon	τ tau	ν <sub>e</sub> electron neutrino	ν <sub>μ</sub> muon neutrino	ν <sub>τ</sub> tau neutrino	γ photon	Z Z boson	W W boson		

Room 2

<b>+2/3</b>	<b>-1/3</b>	<b>-1</b>	<b>+1</b>	<b>0</b>		
Up quark	Down quark	Electron	W+	Electron neutrino		
Charm Quark	Strange quark	Muon			Muon neutrino	Z0 Boson
Top quark	Bottom quark	Tau			Tau neutrino	Photon
		W-			Higgs Boson	Gluon

A “prompt” frame and a group frame for in-class active learning exercise

# Example 3: Research – Whole class

- Sometimes I simply use one jamboard frame for a whole class research activity.

Hi SPD! My phone's AI says this kitten is my cat. I know he isn't. AI doesn't know everything I know! Your job is to post questions for me to convince you. Or, Mika will be labeled as a bird thief. What would you ask?

What color are his eyes?

What color is Prince Mika?

Is MIKA black?

does she have a red bed

Is that green or yellow I'm not sure

The color and pattern of your cat.

Where is this picture taken?

Can I have a picture of the real Prince Mika

eye color

Is this even a cat at all?

What shape are his ears?

Do you really have a cat?

how big is mika?

is this your cat

Spotlight

Platon

# Example 4: Pre-class Exercise

- Jamboards are great for flipped-learning. Students can learn the material and do the exercise before class, ready for discussion.

How does CMS compete with other particle accelerators to get funding?

Most common type of particle collision in CMS?

What breakthroughs are you hoping for in the new collider?

How has the pandemic affected your operations?

What would happen to the detectors if there was an earthquake?

How hard was it to move to CMS and work there directly, was it socially or/and financially?

Most common type of problem you run into?

How easy is it to access and replace damaged detector elements (especially within the central detector section, like the tracker or calorimeters)?

BEFORE the visit:  
Please come up with questions in preparation for the CMS Virtual Visit on 9/29/2020

How many people are working on CMS at any given point?

What is the process that goes into replacing one of the pieces of the detector?

Are there any internships (undergrads) can get at CMS?

# Tool 2: Mentimeter

- Mentimeter lets you create, store and share interactive presentations for polls, quizzes, etc.
- Very easy to run in-class and fun (much better than poll-everywhere)
- Some cons:
  - Free version is good for sharing with an audience on the spot, but not very easily accessible to students.
  - For many slides/ multiple questions, stragglers may have a hard time keeping up.

The screenshot shows the Mentimeter website interface. At the top left is the Mentimeter logo. On the right, there are buttons for 'Upgrade', a help icon, and a user profile icon. The main content area displays two presentation cards. The first card is titled 'What is the equation for potential energy?' and features a bar chart with four bars representing different options. The second card is titled 'What happens when supply increases but demand is unchanged?' and features a horizontal line with three points marked 'Price increase', 'Price decrease', and 'Nothing'. A sidebar on the left contains navigation links for 'My presentations', 'Inspiration', and 'Branding & Colors'. A 'NEW' badge is visible in the top left of the sidebar. A promotional pop-up is also present in the bottom left of the sidebar, asking 'Want more engagement? Let your audience add instant comments' with a 'Show me more' button. A blue chat bubble icon is located in the bottom right corner of the main content area.

**Mentimeter** ★ Upgrade ? 👤

My presentations  
Inspiration  
Branding & Colors

**NEW** ×

Want more engagement?  
Let your audience add instant comments  
Show me more

**What is the equation for potential energy?**

Formative assessment in physics class  
Use Mentimeter to assess the students' knowledge without anyone feeling exposed for not being able to answer correctly.  
Add to my presentations

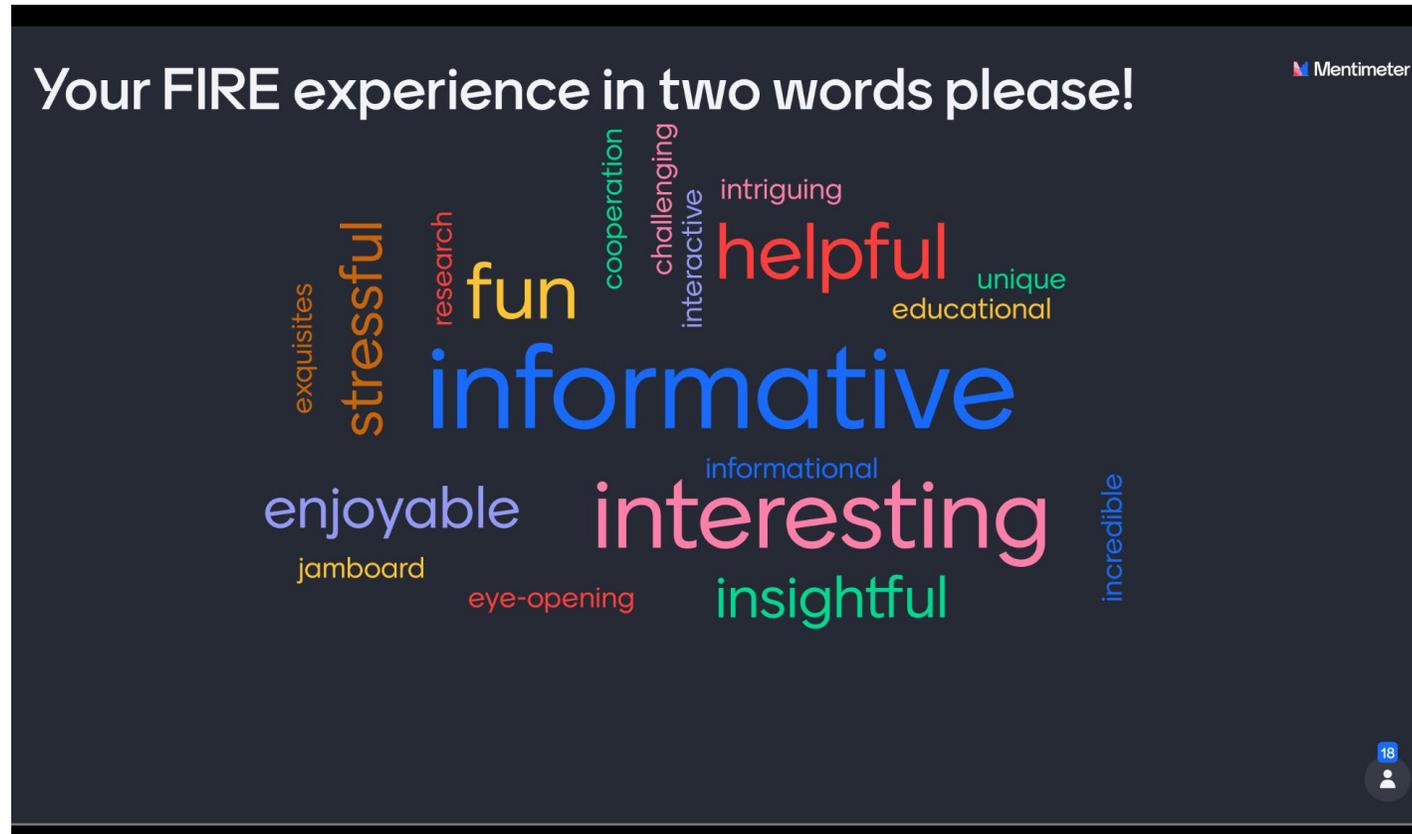
**What happens when supply increases but demand is unchanged?**

Economics quiz  
Test your students' economics knowledge with this fun and interactive quiz.  
Add to my presentations

🗨️

# Example: Feedback word-cloud

- So far, I have only used menti for my end-of-course feedbacks. Anonymity gives students a chance to be open and sincere!



# Conclusions

- Teaching a research course, I find it powerful to add active-learning components in my classes.
- Today's internet technology gives instructors the freedom and possibility to use and apply in-class/virtual synchronous tools for various purposes.
- Every tool has its strength and weaknesses, so user should pick what works best.
- I will continue exploring tools in active physics teaching/research courses.
- I will continue using some of the tools mentioned when in-person, but probably not as extensively. Nothing really replaces face-to-face student-teacher interaction in the classroom!

# Any questions/comments?

- Please feel free to drop your questions and comments [on this jamboard](#) (anonymous) 😊
- Please also feel free to email *mkaragoz@umd.edu*.
- Thank you!

**Acknowledgements:** UMD FIRE, UMD Physics and UMD CMS groups. My amazing students!