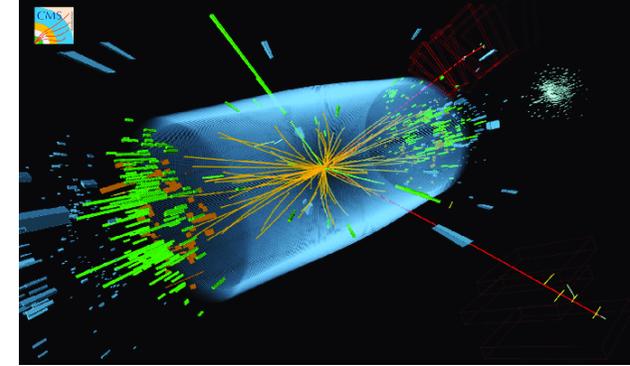


# FIRE: THE FIRST-YEAR INNOVATION & RESEARCH EXPERIENCE

**SIMULATING PARTICLE DETECTION**



## Examples of Collaborative Tools Used During Remote-Learning

**Muge Karagoz, UMD**

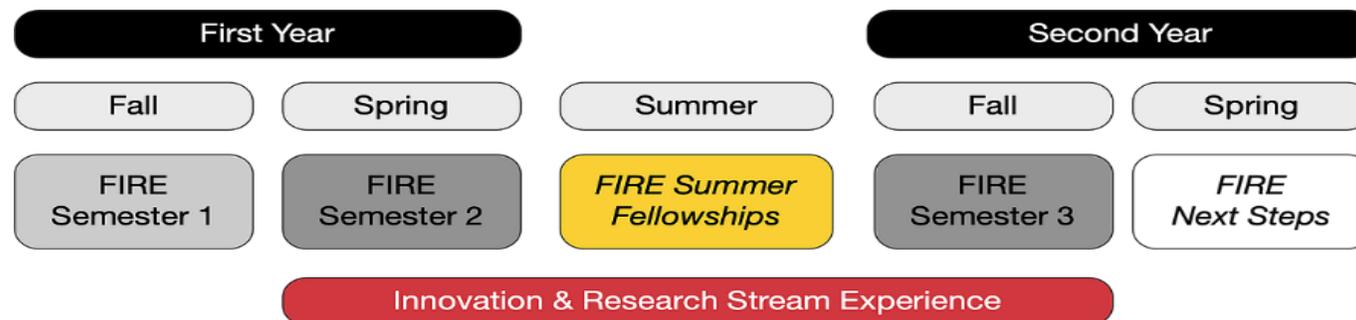
**CSAAPT Virtual Meeting, 4/17/2021**

# Outline

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

# What I teach?

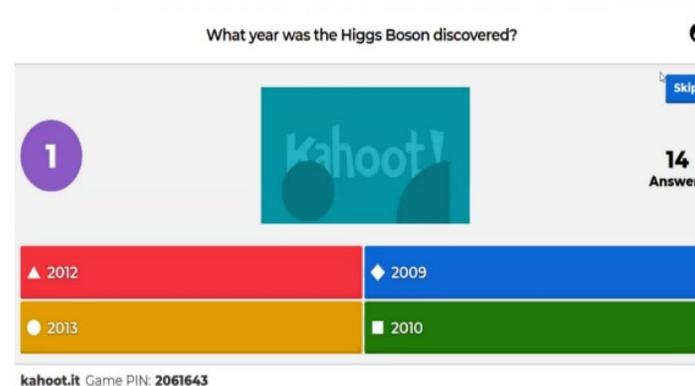
- A curriculum-based research course (“stream”) at UMD as part of the First-Year Innovation & Research Experience (FIRE) program (~15 FIRE streams).
- Each stream is a research group of one leader (Research Educator), 1-2 faculty advisors, ~ 35 students, and up to 15 Peer Research Mentors. Streams have 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?

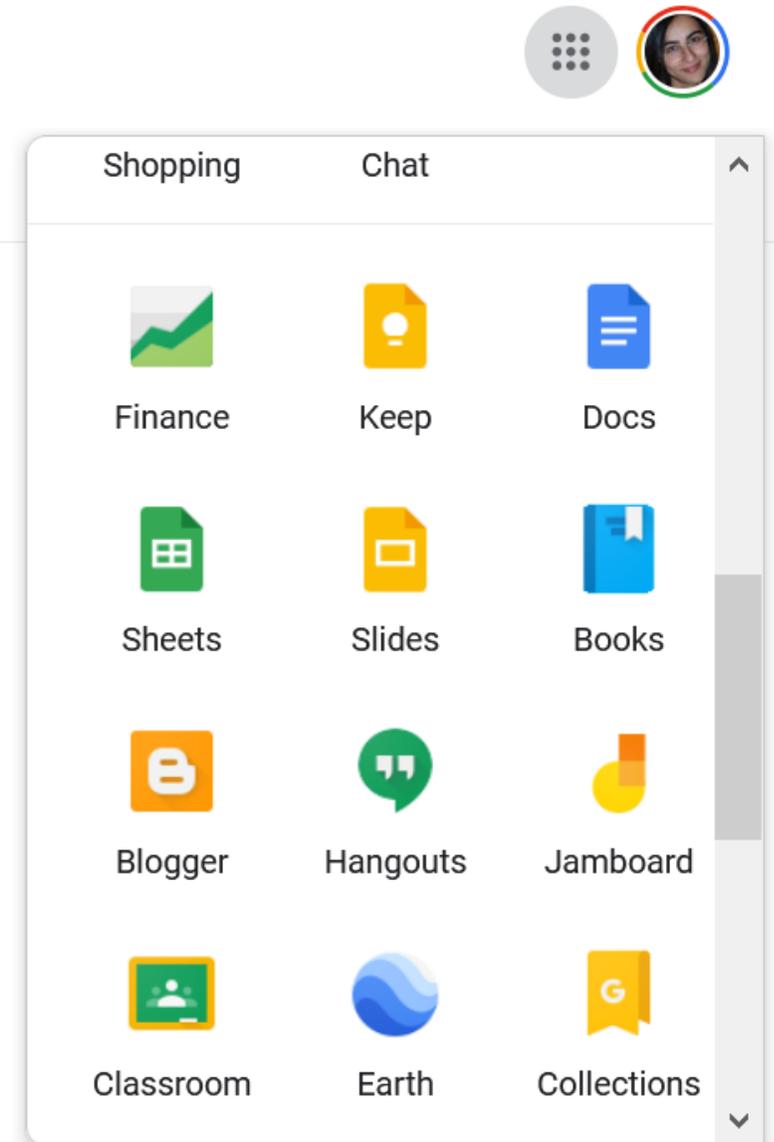
- What pedagogical purposes can tools be used for?
  - Community-building, fun ice-breaking
  - Educational & Research activities
- Being a curriculum-based research course, and a computational technology stream that concentrates on collaborative and research tools, I've utilized many online tools online 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

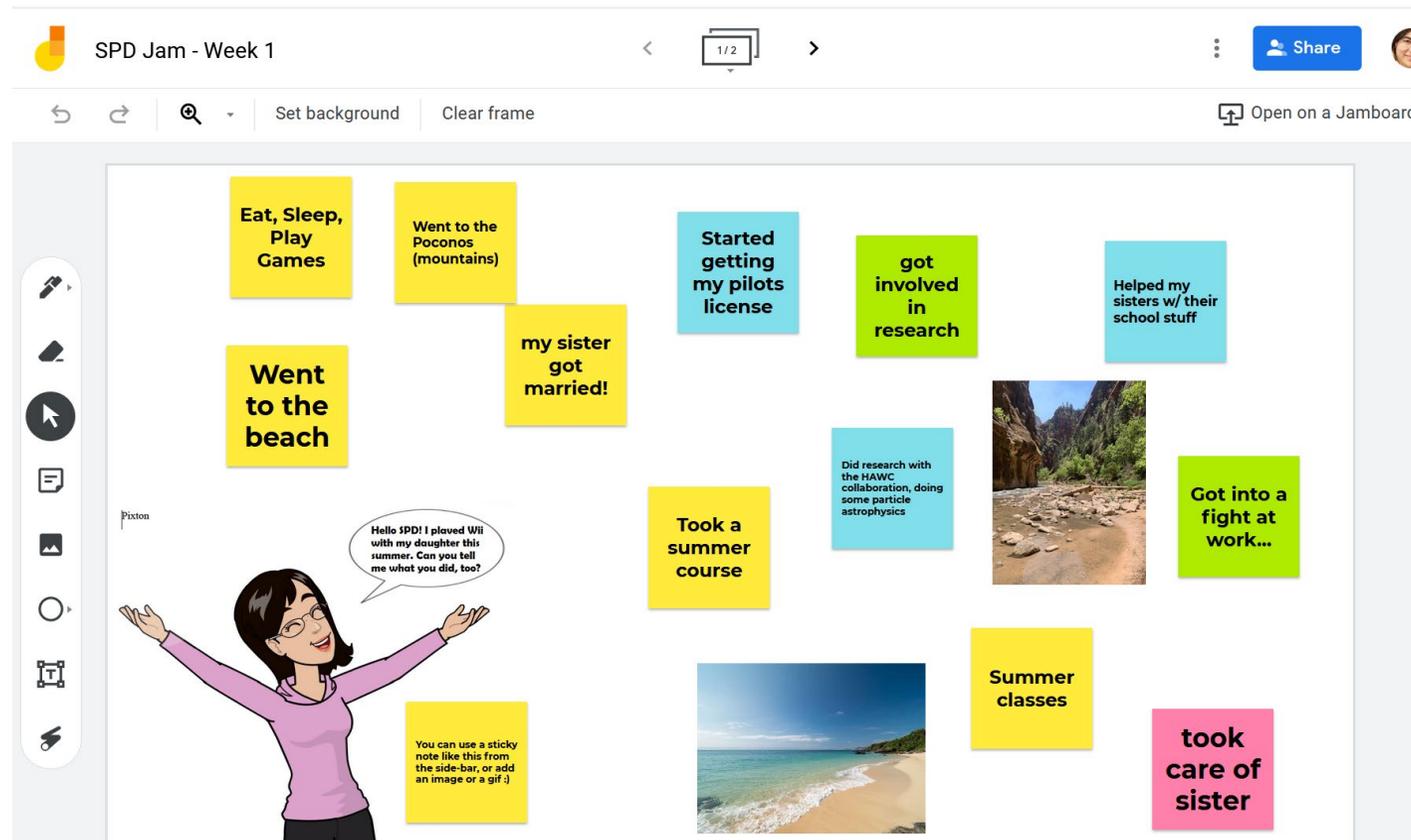
# Tool 1: Google Jamboard

- 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)

generation	I	II	III	bosons	
quarks	u (up)	c (charm)	t (top)	g (gluon)	H (higgs)
quarks	d (down)	s (strange)	b (bottom)	γ (photon)	
leptons	e (electron)	μ (muon)	τ (tau)	Z (Z boson)	
neutrinos	ν <sub>e</sub> (electron neutrino)	ν <sub>μ</sub> (muon neutrino)	ν <sub>τ</sub> (tau neutrino)	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?

Dec 30, 2017

Spotlight

Platon

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

# 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 could we (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.

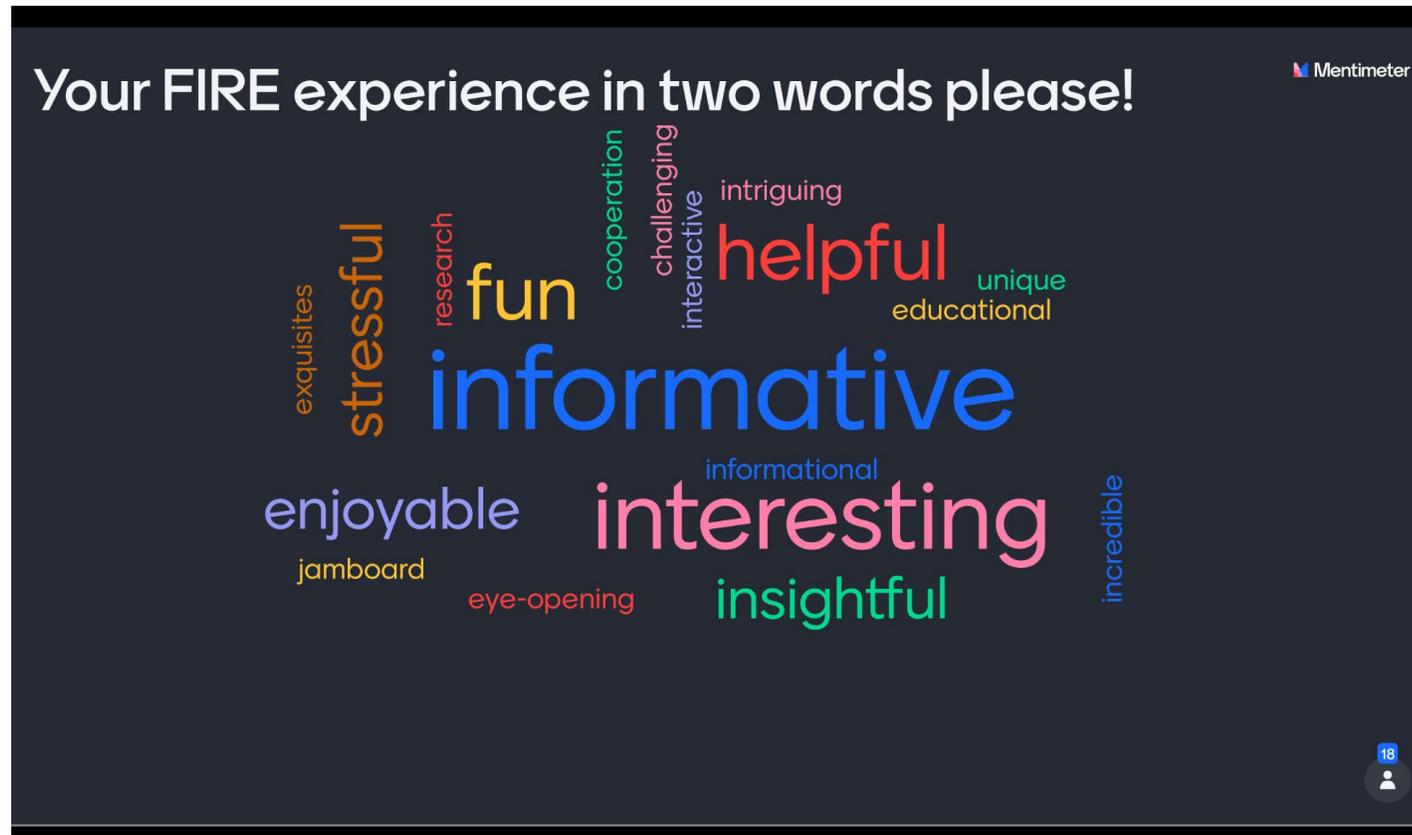
The screenshot shows the Mentimeter website interface. At the top left is the Mentimeter logo. On the right, there are buttons for 'Upgrade', a help icon, and a user profile icon. The left sidebar contains 'My presentations', 'Inspiration', and 'Branding & Colors'. A 'NEW' badge is visible on the sidebar. The main content area displays two presentation examples:

- Example 1:** A bar chart titled 'What is the equation for potential energy?'. The x-axis lists 'U=mgh', 'U=mh', 'U=mgh/2', and 'U=mgh'. The 'U=mgh' bar is the tallest. To the right, the text reads 'Formative assessment in physics class' and 'Use Mentimeter to assess the students' knowledge without anyone feeling exposed for not being able to answer correctly.' Below this is a blue 'Add to my presentations' button.
- Example 2:** A quiz titled 'What happens when supply increases but demand is unchanged?'. The x-axis lists 'Price increase', 'Price decrease', and 'Nothing'. The 'Price decrease' option is marked with a green checkmark. To the right, the text reads 'Economics quiz' and 'Test your students' economics knowledge with this fun and interactive quiz.' Below this is a blue 'Add to my presentations' button.

At the bottom right of the interface is a blue chat bubble icon. A sidebar notification on the left says 'Want more engagement? Let your audience add instant comments' with a 'Show me more' button.

# 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!