Keeping Voices in the Room:
Gathering Values in Codesign for Equitable STEM Experiences

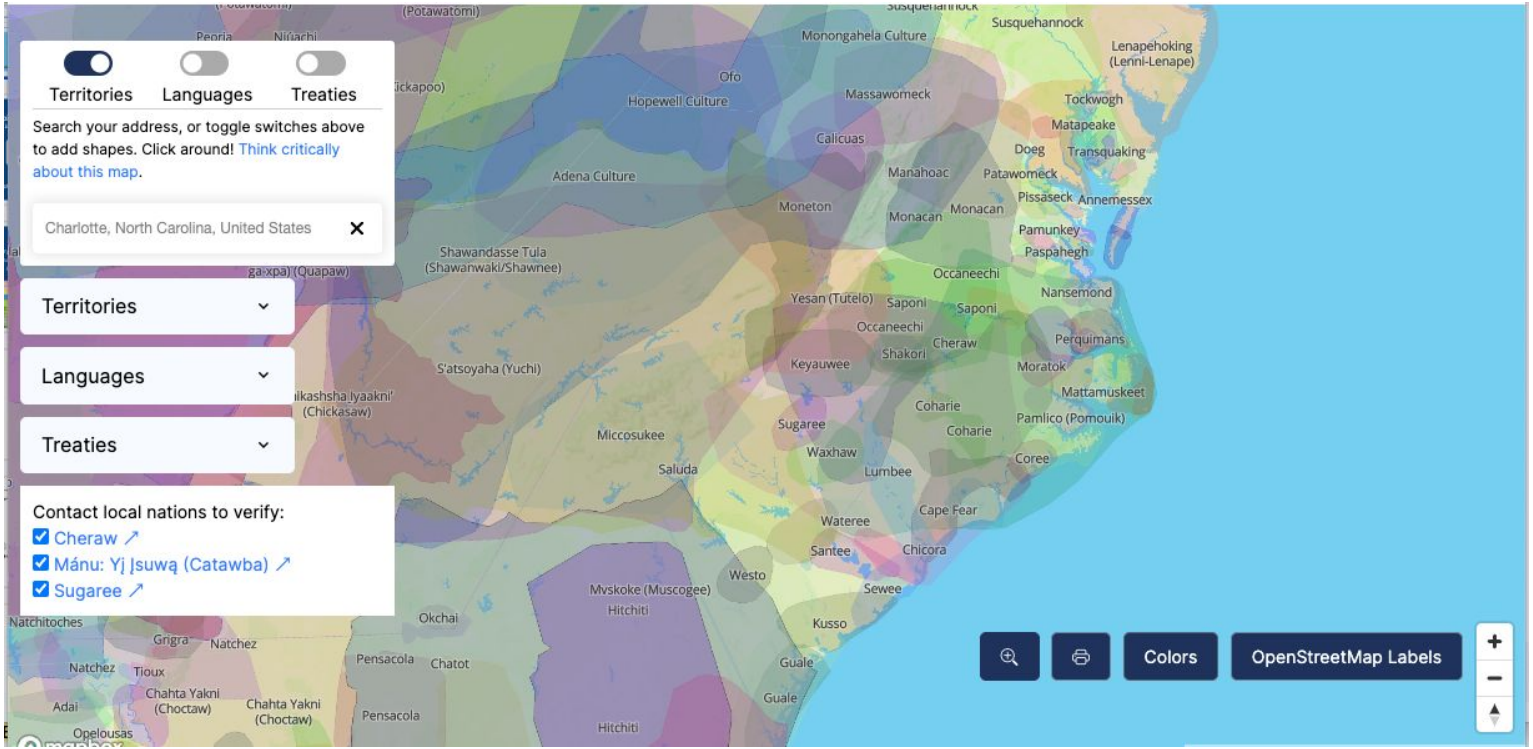
MAKING WAVES
with radio

ASTC 23
October 9, 2023 - Charlotte, NC

This work is support by a grant from the National Science Foundation. DRL - #2053160, PIs: Hsi, Porcello, & Oh

Land Acknowledgement

We acknowledge that the land that we work on today in Charlotte is on the occupied territory of the Sugaree, Catawba and Cheraw Tribes. We pay our respect to elders both past and present. We strive to learn from native American cultures and traditions of those who may be here today.



Agenda

1. Our story of co-design (30 min)
2. Group activity - Interact with radio products (20 min)
3. Sharing & Discussion (10 min)

Presenters & Facilitators

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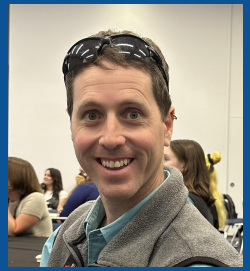


- Sherry Hsi, BSCS Science Learning
- David Knudsen, Museum of Life and Science
- Diego Rojas, BSCS Science Learning
- Heather Segale, Tahoe Environmental Research Center, UC Davis
- Steve Scholle, Museum of Life and Science
- Darrell Porcello, Children's Creativity Museum & The NISE Network

Part 1: Our story

Once upon a time...

More science!

More fun!

More equity!

Better learning!

More participation!

More joyful making!

What if....

We could have more science awareness and engagement to more people about how our mobile technologies work?

We could demystify the invisible electromagnetic waves that surround us, the same ones that carry our information safely across the world

Empower informal educators with learning resources to help them teach others in their communities

National Science Foundation

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DRL - #2053160

Teams and partners

Year 1 of the Project

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Literature Review

Guiding NRC Principles

Content map + "Big Ideas"

Front end evaluation

An on-going challenge

How can we engage in equity-oriented and participatory design with our multiple stakeholders?

- *Making Waves with Radio* team
- Informal educators & community members
- Disciplinary and STS experts
- Audiences - families, youth, public

Let's "bake" equity into everything we do

vs.

NISE
NATIONAL INFORMAL
STEM EDUCATION
NETWORK

Co-design

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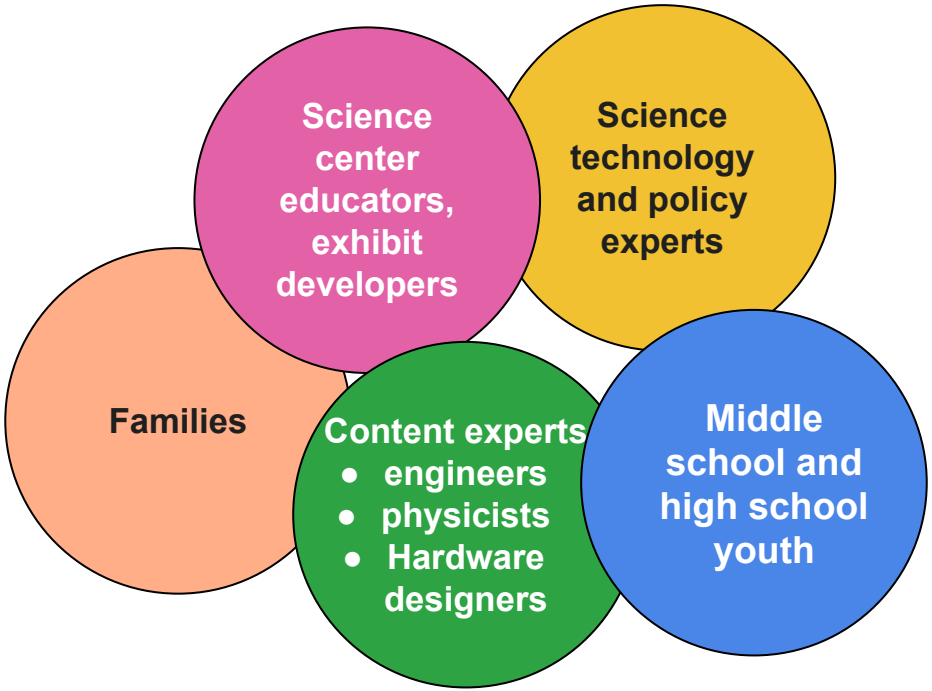
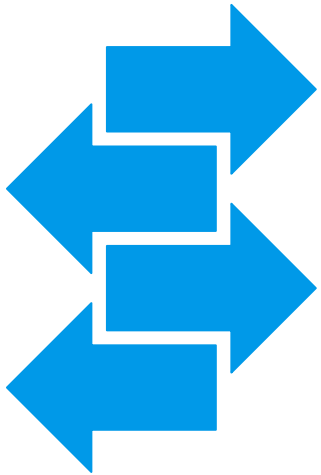


Co-design

A collaborative process to bring diverse perspectives from multiple stakeholders to collaborate on creating something that meets their shared needs.

- All stakeholders are involved in the design
- Active collaboration between users and designers
- Users are the experts of their own experiences



- Boosts collaboration
- Increases openness to innovation and change
- Leads to more credible and equitable solutions

Why codesign?

The goal of codesign is to ensure all stakeholders and participants have equal power, bring their knowledge and diverse perspectives, and voices into consideration.

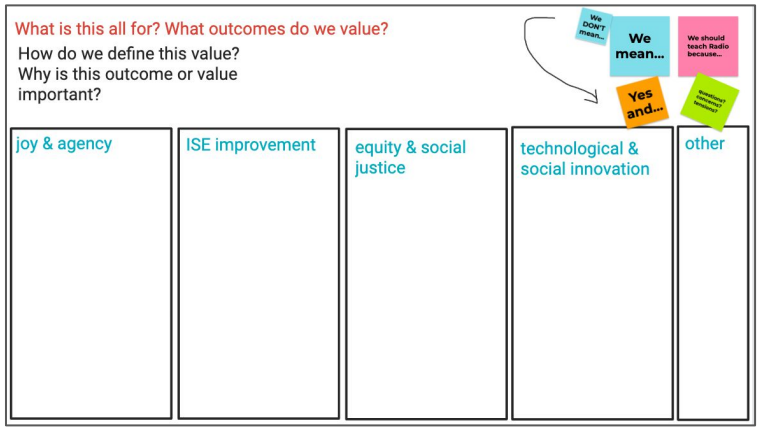
- Codesign can promote equitable and inclusive design processes.
- Co-design amplifies the voices of learners and invites participation
- Co-creation expands who gets to create learning materials and environments

Why collect values?

- Underlying values influence design.
- Values can make designs more innovative and inclusive
- Our values cannot be assumed to be the same as our intended audiences.
- Well designed materials should reflect the values, vision, and experiences of many people.

General Steps of Values Mapping Process:

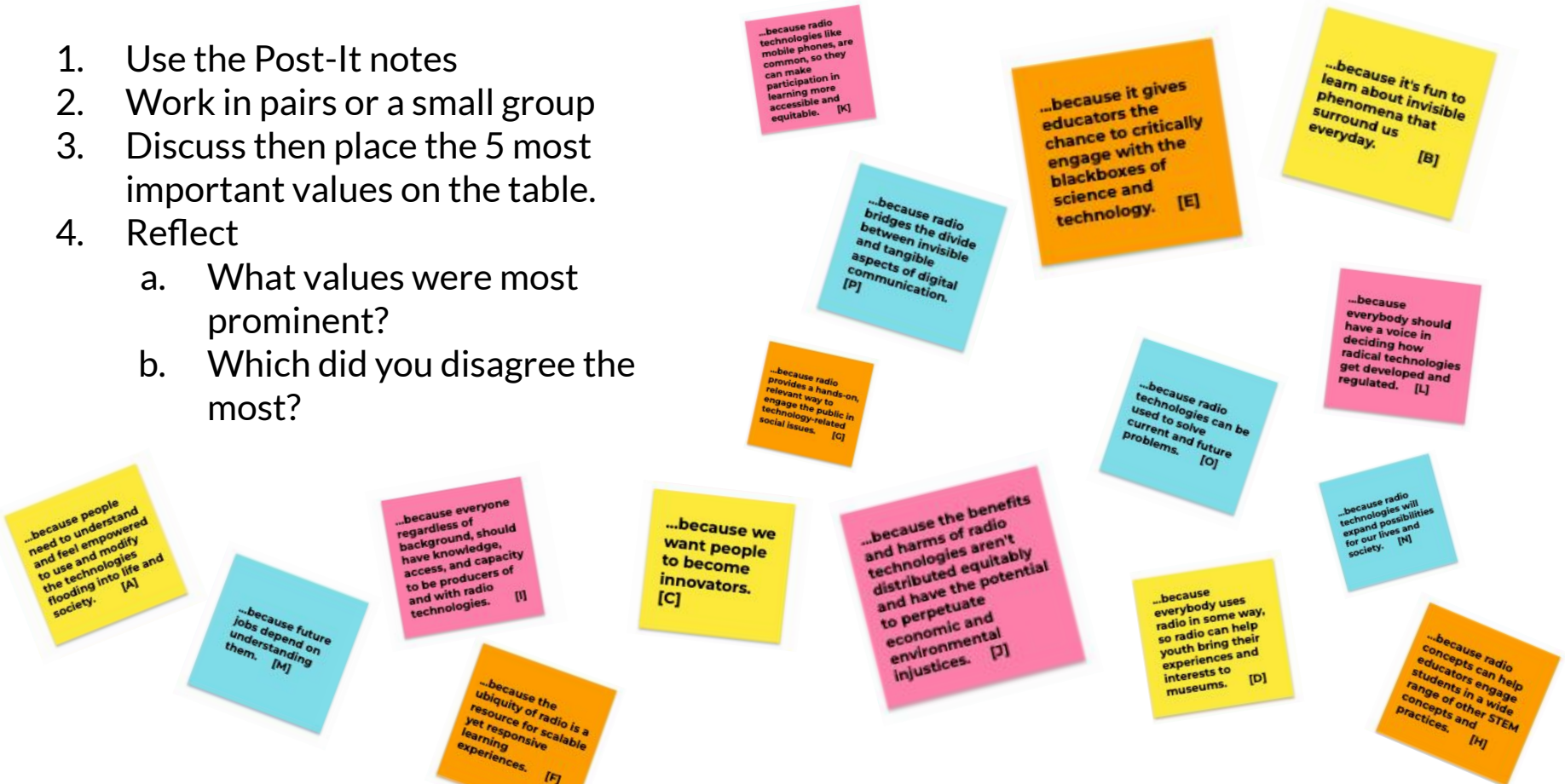
1) Generate initial values for radio education
2) We used Jamboards in envisioning exercise: brainstorm “rationale” - reasons that it might be important or valuable to teach people about RF concepts and technologies.



(Friedman, 1996; Dixon, Colin., Hsi, Sherry., Van Doren, Seth, 2022)

Values Mapping - "We should teach radio because…"

1. Use the Post-It notes
2. Work in pairs or a small group
3. Discuss then place the 5 most important values on the table.
4. Reflect
   a. What values were most prominent?
   b. Which did you disagree the most?



CSforAll

Competencies and Literacies

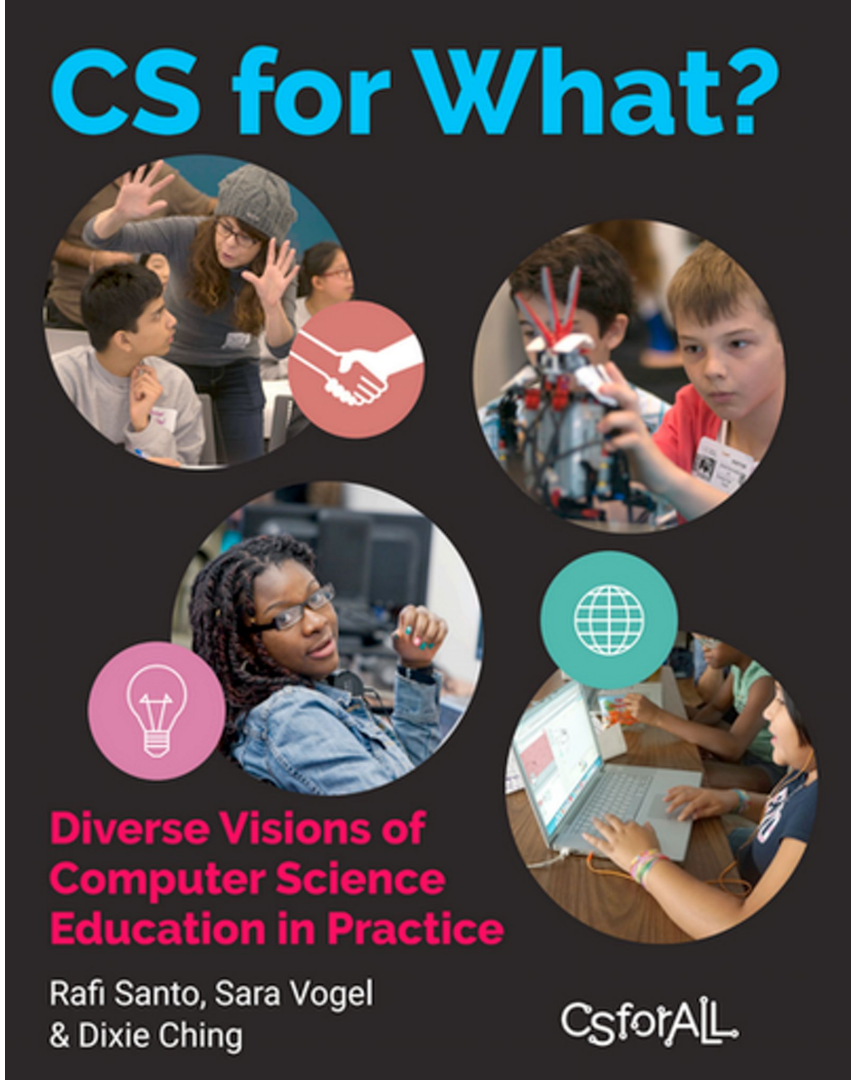
Community and Civic Engagement

Personal Joy, Agency and Fulfillment

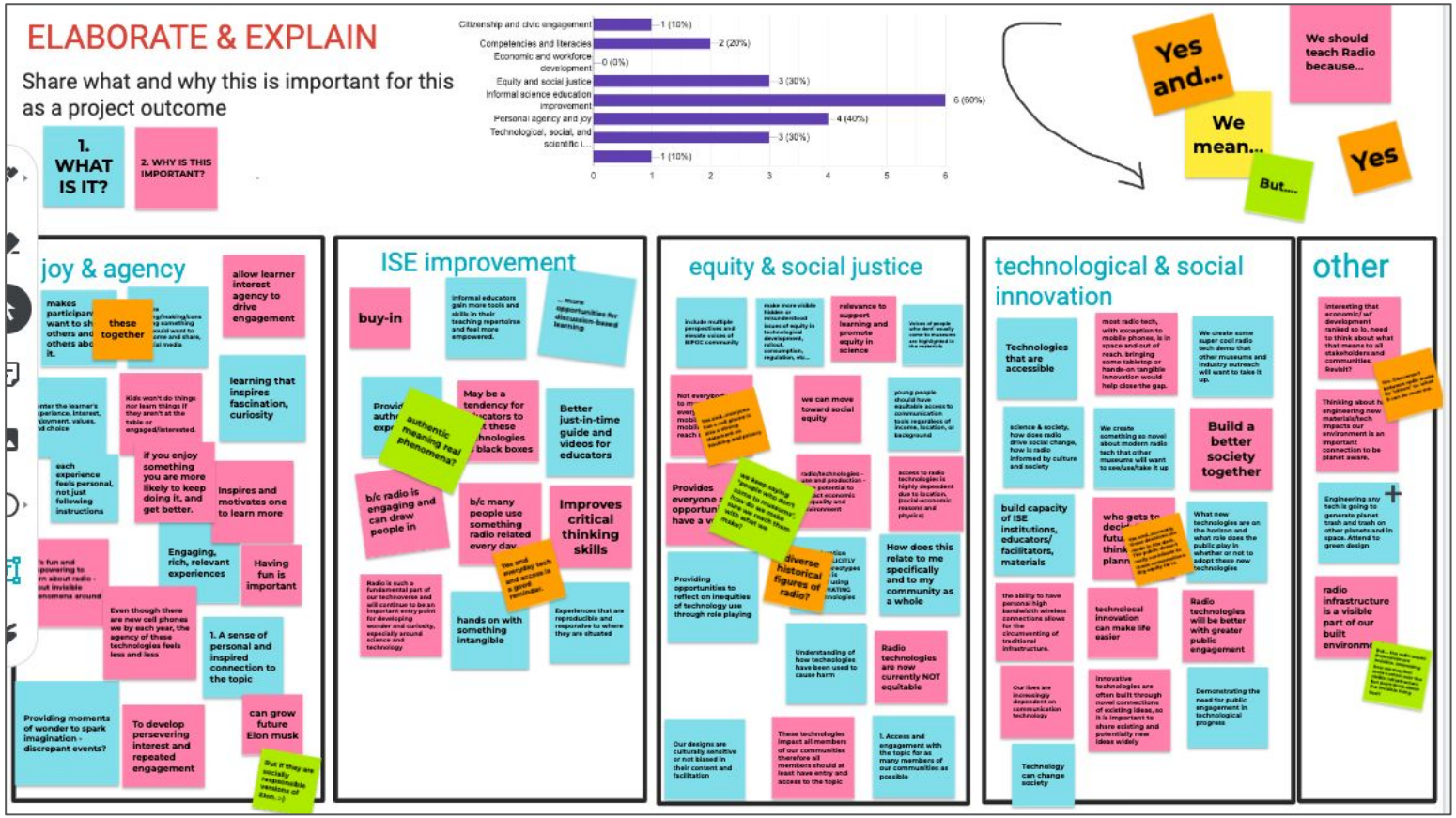
Technological, Social, & Scientific Innovation

Equity and Social Justice

Economic and Workforce Development



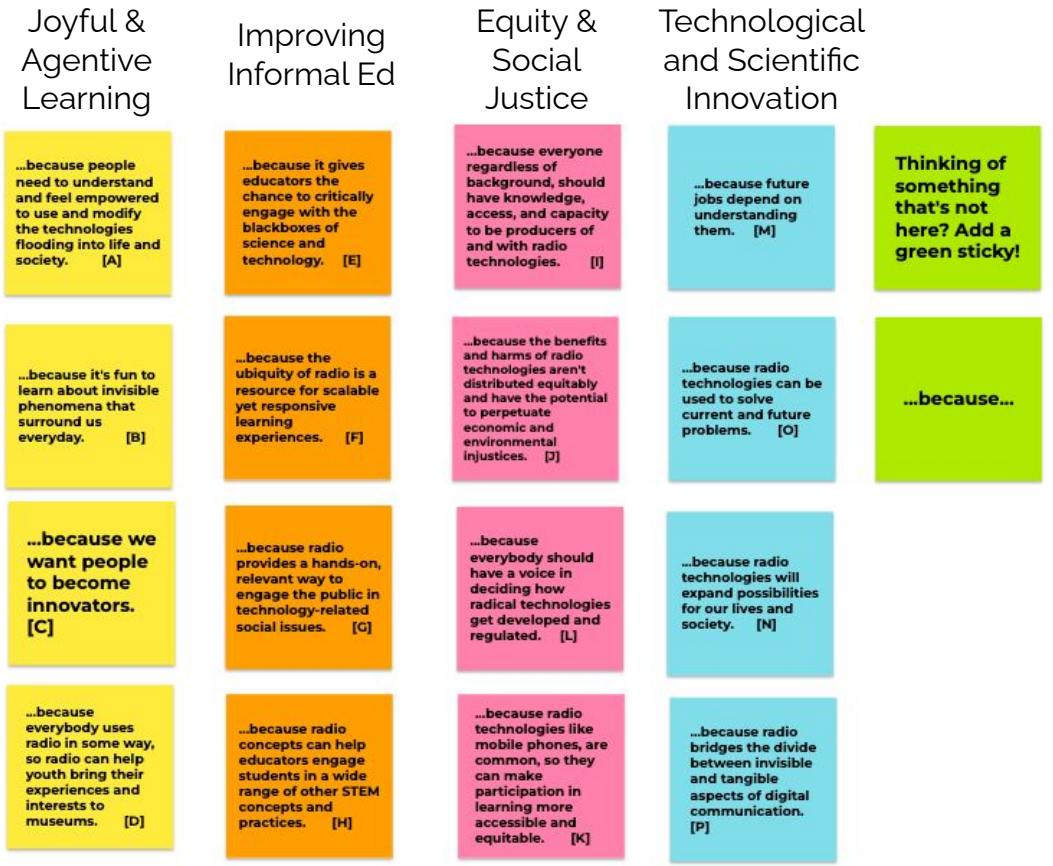
Organizing our responses



Values Mapping - Establishing Categories

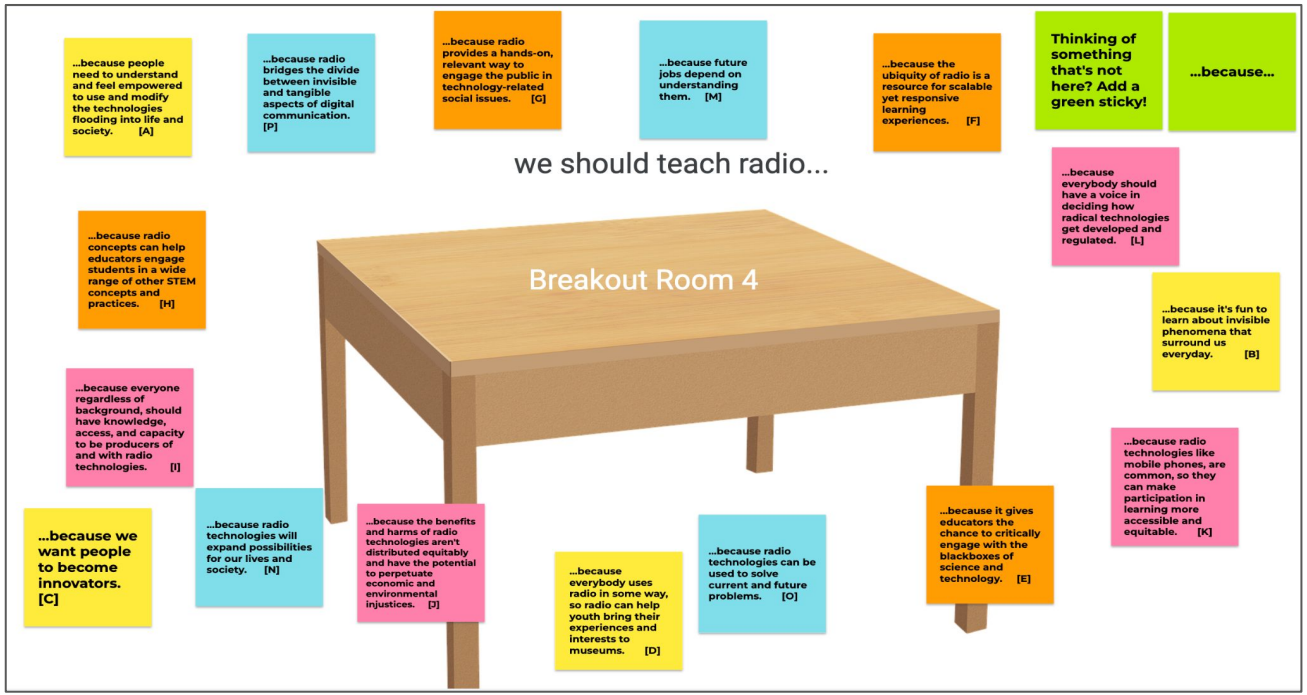
Four main values and themes identified through value mapping:

1. Joyful and Agentive Learning
2. Improving Informal Education
3. Equity and Social Justice
4. Technological and Scientific Innovation

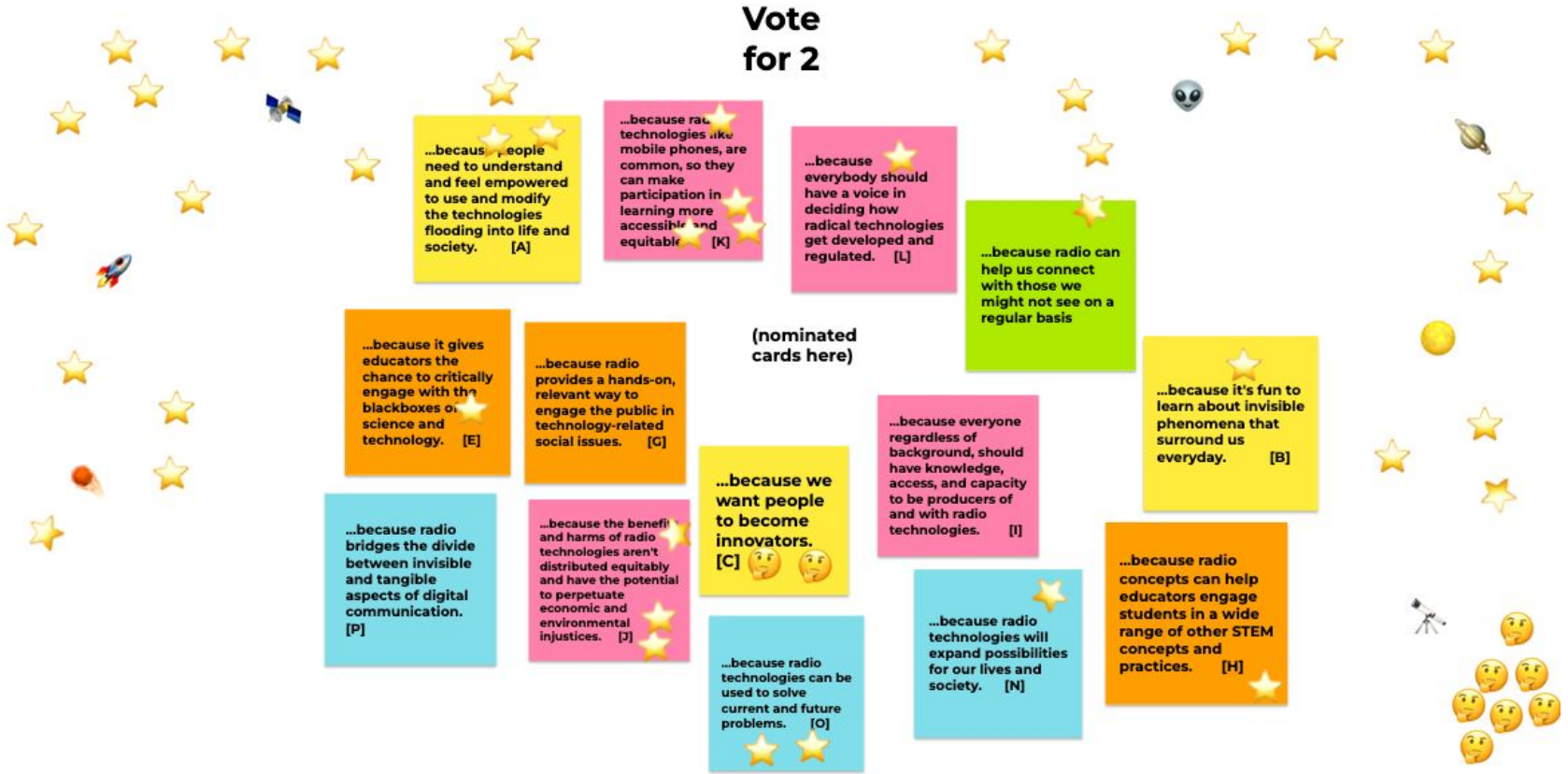


Heat values mapping exercise

- Elicited values and design rationale from team members using blank Post its. We should teach radio because….



Voting on Values



Q: ***What are the two most important outcomes from learning about the Making Waves with Radio Project ?***

Improving informal education (60%)	**Joyful and agentive learning (40%)**
Equity & Social Justice (30%)	**Technological and Scientific Innovation (30%)**

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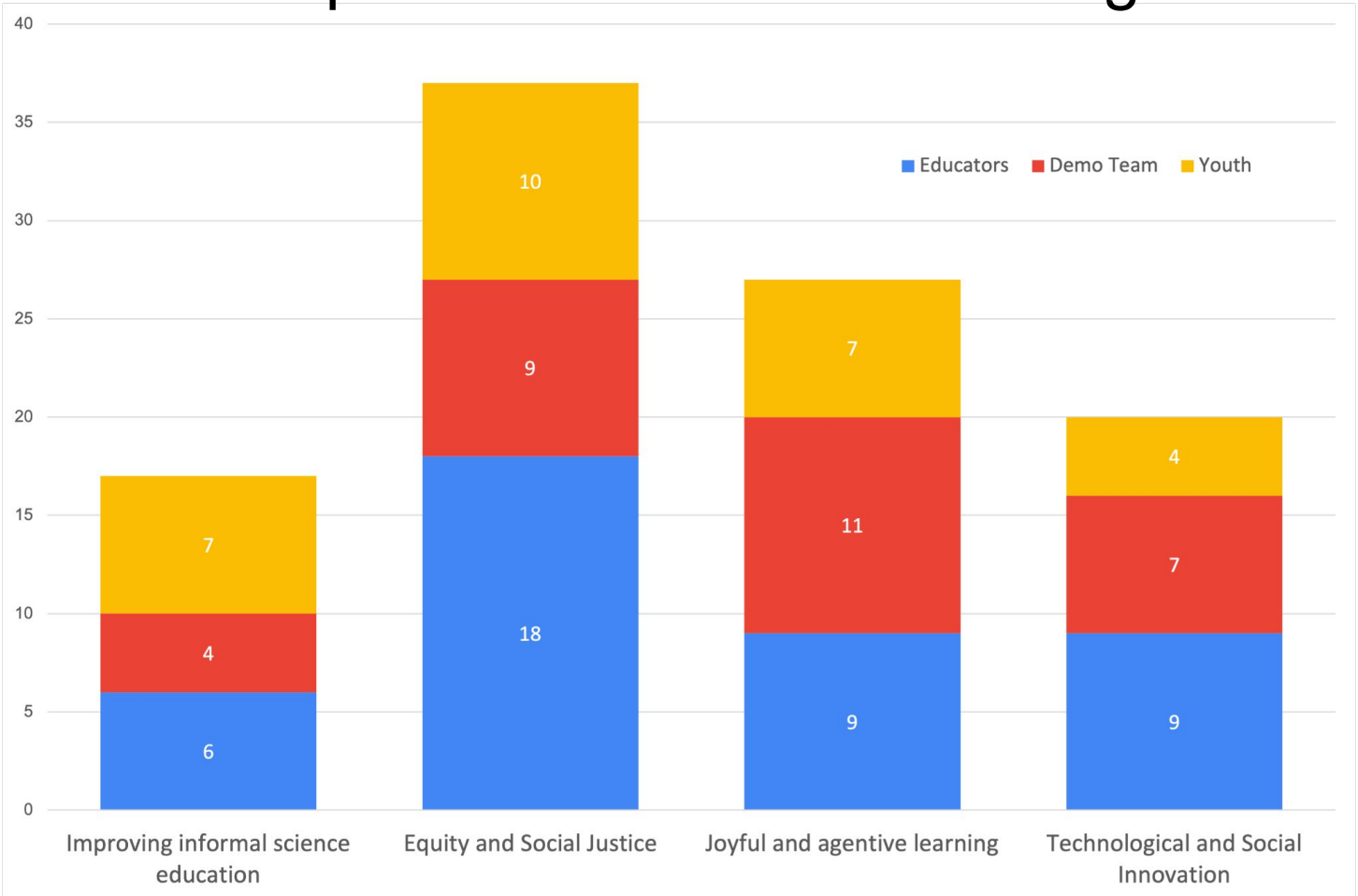
Our stakeholders thought otherwise….!

Compiled values across ISE orgs



Making Waves Design Values

We believe we can improve informal science education by….

- cultivating mutual learning and empowering ISE leaders, designers and educators to adapt resources to their communities and goals
- supporting informal science education with teaching strategies and just-in-time supports to build capacity in new socioscientific topics
- building capacity to create interactive learning experiences connected to real-life issues and phenomena

ISE Reform & Improvement

Equity & Social Justice

We believe we can work to make society more just and equitable by...

- meaningfully engaging with people and perspectives that have been historically marginalized from educational institutions
- explicitly countering stereotypes about who is capable of technological innovation
- showing connections between STEM concepts and technologies and community life
- making visible ways that benefits and harms of technology are unfairly distributed across society

We aim to foster joyful & agentive learning that...

- sparks curiosity and motivates continued learning
- feels rich and relevant to learners
- fosters a sense of ownership - a feeling that one can use, modify or produce technology for one's own purposes
- inspires learners to share learning with family and friends

Joyful & Agentive Learning

We hope to foster technological and societal innovations by...

- demonstrating that technology and society shape each other and that everyone plays a role in our socio-technological futures
- making more transparent the technologies we encounter in our day to day lives
- helping young people become innovators prepared to participate in technological development and workplaces

Technological & Scientific Innovation

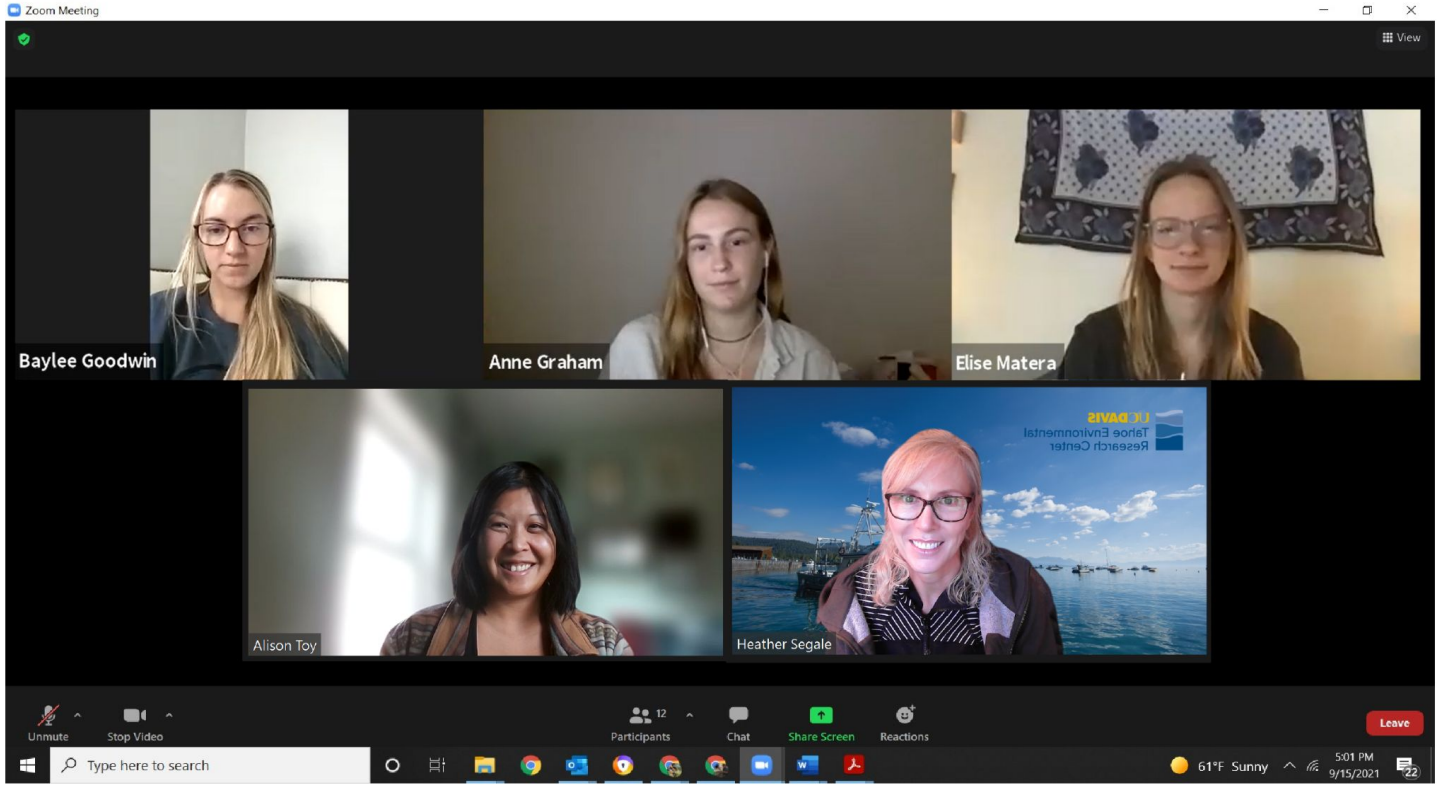
UCDAVIS
Tahoe Environmental
Research Center

Located at
Lake Tahoe,
California/Nevada

UC Davis Tahoe Science Center

- 5,000 square ft
- 2 Full-time staff
- 3 AmeriCorps members
- Programming for 15,000 annually, including 4,000 - 5,000 K-12 students

Tahoe Environmental Research Center Education Team - What did we experience?



Top Votes for Equity & Social Justice!

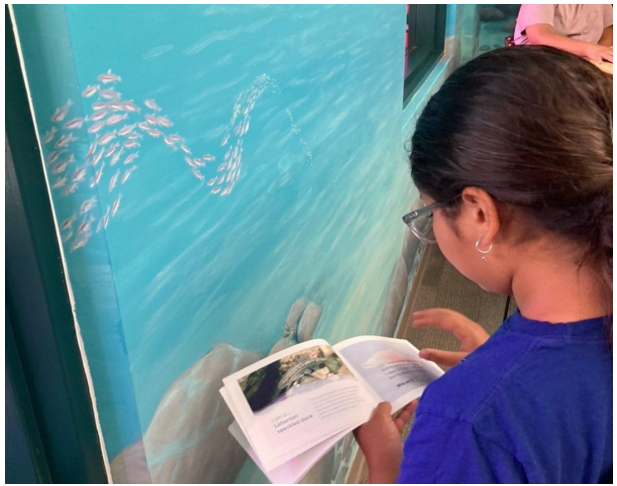
…make participation in learning more accessible and equitable

… everybody should have a voice

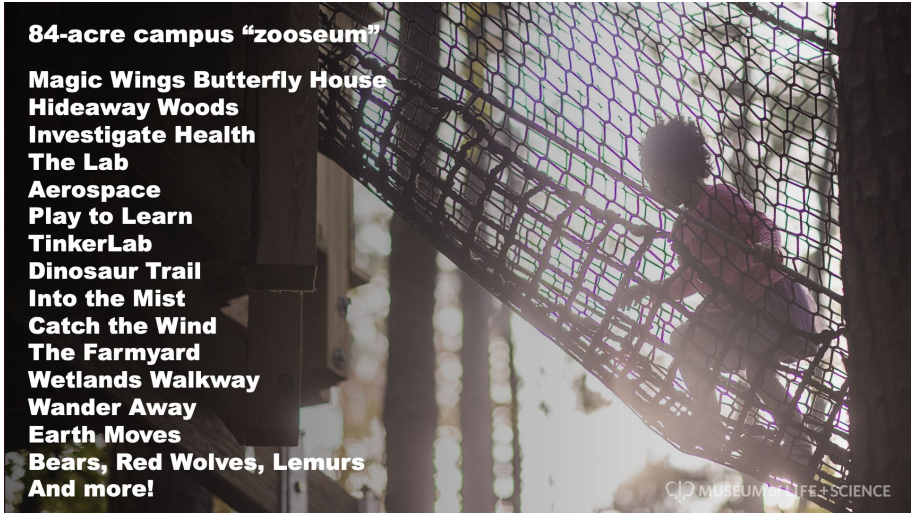
… regardless of background should have knowledge, access, and capacity

Reflection from TERC Experience

- SURPRISE: “Equity and Social Justice” topics (pink cards) ranked highest in our group voting!
- Started a conversation about equity in planning exhibits
- Active recruitment for formative evaluation participants:
  - Wá·šiw People (Washoe Tribe of NV/CA)
  - Dean’s Future Scholars - Nevada First-Gen Network
  - Kings Beach Two-Way Immersion School
- Increasing diversity for our summer internships
- Offering Diversity, Equity and Inclusion workshops for staff



Museum of Life and Science Team




OUR GOAL:
NURTURE CRITICAL THINKERS
MUSEUM of LIFE + SCIENCE

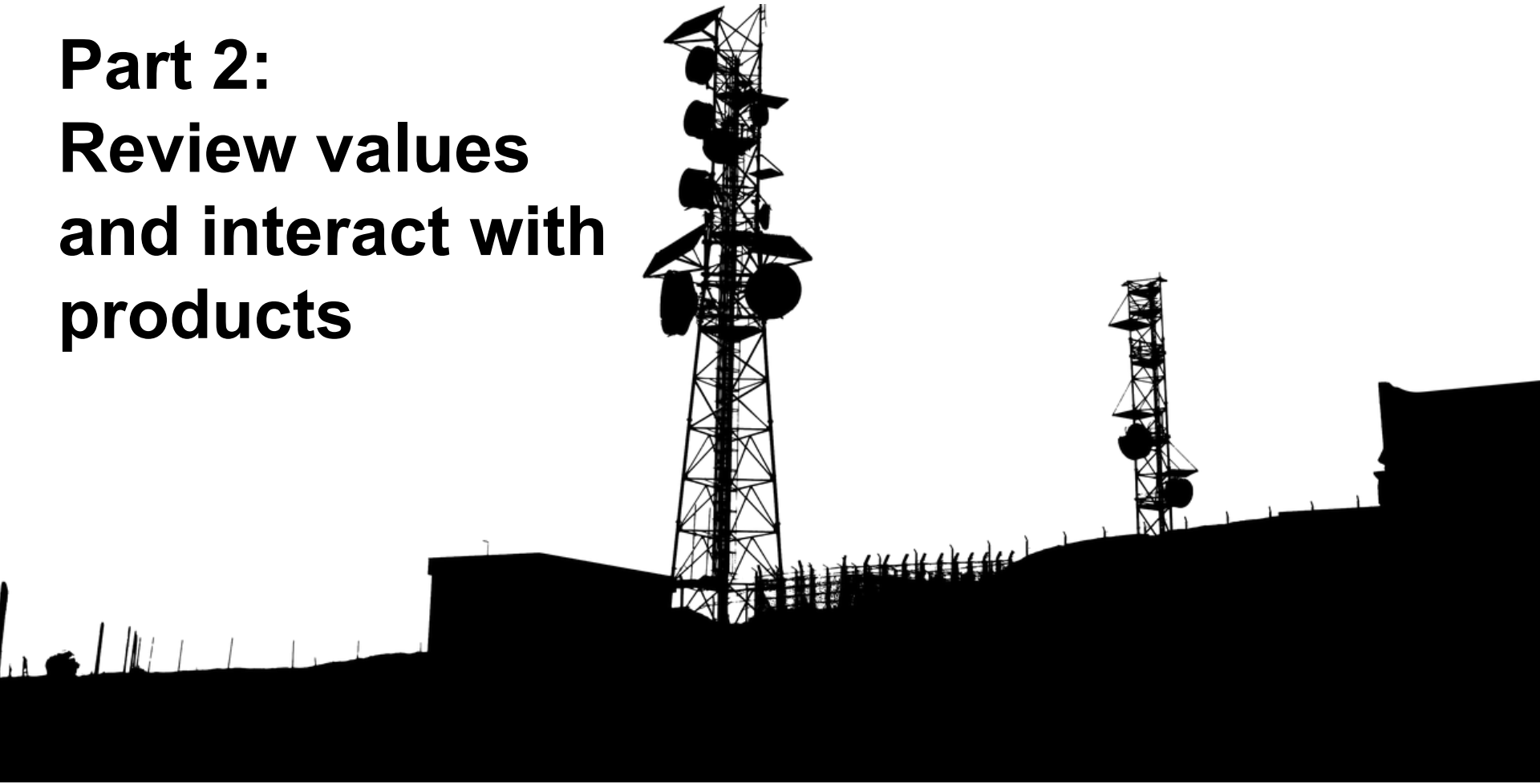
MLS Project Experience

- Reflecting on and connecting our institutional values and experiences at a national scale

- Don’t just sprinkle it on, bake it in!
  - Directly brought forward our learning from the codesign process into activity development

- Engaged and deepened existing partner relationships through activity prototyping with formative audience and educator evaluation
  - El Centro Hispano
  - El Futuro

Part 2: Review values and interact with products



Making Waves Activities

Radio Explorers

Radio Silence

Messages from Space

Wi-Fi Detective

Radio Futures

You Decide

I Spy Radio

+Spanish versions
+mobile apps
+activity training videos
+content training video

nisenet.org/radio

Wi-Fi Detector app

- Minimal, sleek, kid-friendly
- Multiple Visualizations
- Historic Data Graph
- Audio Representation
- Spanish Translation
- Accessible Contrast Modes
- QR Code sign available

GET IT ON Google Play

DISPONIBLE EN Google Play

bit.ly/wifidetector

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Equity & Social Justice

Promoting inclusive engagement with historically marginalized groups in education and technology, challenging stereotypes, highlighting STEM's relevance to communities, and shedding light on technology's uneven societal impacts.

Joyful & Agentive Learning

Promotes joyful, self-driven learning that encourages curiosity, motivates ongoing exploration, and instills a sense of ownership, inspiring learners to share their knowledge with others.

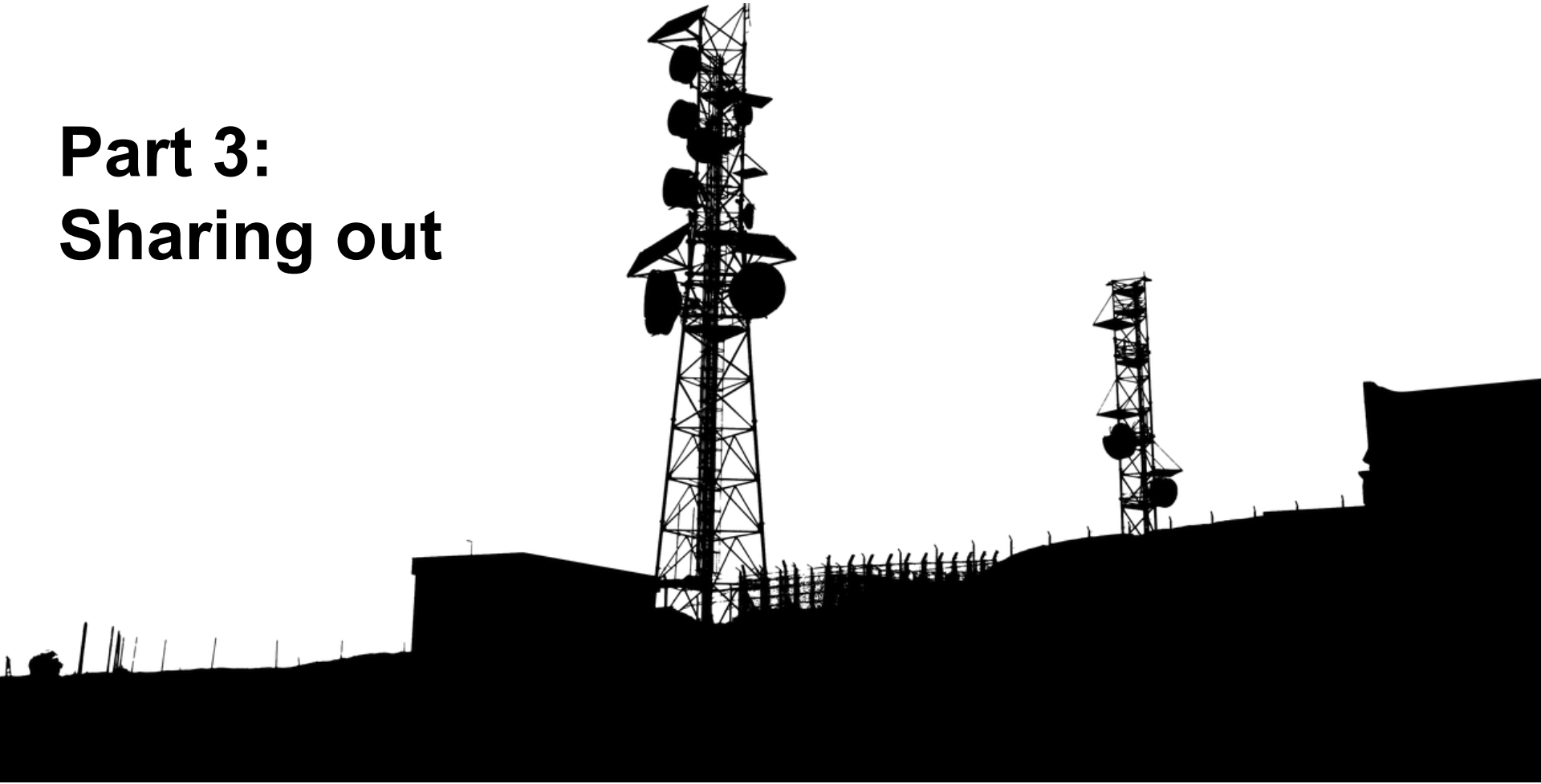
ISE Reform & Improvement

Empowering ISE leaders and educators for adaptable, effective informal science education, encompassing resource customization, socioscientific topic expertise, and interactive learning experiences related to real-world issues.

Technological & Scientific Innovation

Encourages technological and societal innovation by emphasizing the interconnectedness of technology and society, enhancing transparency in everyday technologies, and equipping young individuals to be innovative contributors in the tech-driven world.

Part 3:
Sharing out



Reflection

- Do you see values reflected in the activities you experienced?
- How might you adapt this activity to reflect additional values from your own team or community?
- How might your institution use codesign to support STEM equity?

But there are still more voices to include...

- The codesign process continues with CoP Activate!
- Currently, the Making Waves team is leading a Community of Practice to continue to improve the activities & ensure more voices remain in the design process after the activities are developed.
- We hope to learn what works and what does not work with the activities, what adaptations are partner institutions using, and how this can support their efforts to engage with a wider audience.

¡explora!

EL CENTRO HISPANO
www.elcentronc.org

COLUMBIA MEMORIAL SPACE CENTER
CITY OF DOWNEY

CORPUS CHRISTI MUSEUM of SCIENCE & HISTORY

Children's Museum of Brownsville

ARECIBO OBSERVATORY
Puerto Rico

Resources:

THE CO-CREATE HANDBOOK FOR CREATIVE PROFESSIONALS
https://www.cocreate.training/wp-content/uploads/2019/03/co-design_handbook_FINAL.pdf
National Research Council. (2012). A framework for K-12 science education: Practices, crosscutting concepts, and core ideas. National Academies Press.

Bridging the Designer User Gap by J.Nielsen;
http://www.useit.com/alertbox/designer-user-differences.html

Co-creation and the new landscapes of design by E. Sanders and P. Stappers.
In CoDesign, 4: 1, 5 - 18, 2008

Dixon, C. G., Hsi, S., & Van Doren, S. (2023). Keeping Voices in the Room: Values Clarification in Codesign for Equitable Science and Technology Education. Curator: The Museum Journal, 66(1), 9-28.

Friedman, B., & Hendry, D. G. (2019). Value sensitive design: Shaping technology with moral imagination. Mit Press.

Santo, R., Vogel, S., & Ching, D. (2019). CS for what? Diverse visions of computer science education in practice.

Thank you!

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This work is support by a grant from the National Science Foundation. DRL - #2053160