

NIH SciEd Virtual Conference

November 9-12, 2020, Online Via Zoom

NIH SciEd 2020

Held online via Zoom, the 2020 NIH SciEd Virtual Mini-Conference was the ninth NIH-wide conference for science education projects funded by the National Institutes of Health and the 29th annual conference for the NIGMS Science Education Partnership Award program. The in-person 2020 conference had been scheduled for April 26-29 but was cancelled due to the pandemic. Survey data from the SciEd community indicated that the majority of respondents desired a short Fall 2020 SciEd virtual conference that focused around advancing project goals during the pandemic. The projects represented at the conference were primarily funded by the NIGMS Science Education Partnership Award (SEPA), and the NCI Youth Enjoy Science Research Education (YES) programs.

A total of 358 individuals registered for the conference and 231 attended at least one conference session. Conference participants included 60 project Pls, 24 Co-Pls, 28 project managers, 37 project staff members, 8 internal evaluators, 21 external evaluators, 10 graduate students, 5 post-doctoral fellows, 1 teacher, 24 other individuals, and 13 NIH staff (NIGMS, NCI, NINDS, NHGRI and CIT).

A pre-conference survey showed that members of the SciEd community desired opportunities to learn from others' experiences conducting programs during the pandemic and to have a format in which to reconnect with colleagues. The SciEd Organizing Committee, comprised of SEPA and YES grantees, decided that "open discussion" sessions would best address these interests. Survey data also informed the choice to hold 1-2 sessions over 4 consecutive days. Based on previous SciEd conference strands, the conference was organized into the following 5 sessions: *Informal Science Education* (exhibits, programs for the public and families, and other informal science learning opportunities); *Research and Evaluation* (program research and evaluation designs, methods and instruments); *Teacher Professional Development* (professional learning programs for teachers, in school or outside-of-school); *Research Experiences for Students and Teachers* (research experiences designed for teachers and/or students, during the school year or summer); and *Programs for Students* (in-school and outside-of-school programs, during the school year and summer). In addition, a *Town Hall* session provided updates for SEPA program grantees.

During each conference sessions, facilitators provided guiding questions for participants, who were randomly assigned to small discussion groups of 7-9 people. Typical guiding questions for discussion around running SciEd programs during the pandemic were:

- What programming worked well?
- What challenges did you face and how did you address them?
- What lessons did you learn that would be helpful to others?
- Did you encounter any barriers that felt insurmountable?
- Do you have relevant resources to share with others?

Participants were tasked with recording top recommendations and resources to share with other SciEd programs. At the end of the session, participants reconvened as a whole group and shared top recommendations. The Zoom room was kept open for an additional 30 minutes for informal discussion. This report includes notes from each small group breakout session; transcripts from the whole-group report-outs; the whole-group chat discussions; along with slides and transcripts from the Town Hall.

NIH SciEd 2020 Conference Organizing Committee

Co-Chairs

Louisa A. Stark, PhD, University of Utah Dina Drits-Esser, PhD, University of Utah

Program Officers

Tony Beck, PhD, NIGMS SEPA Program Alison Lin, PhD, NCI YES Program

Committee

Kristin Bass, PhD, Rockman et al Luke Bradley, PhD, University of Kentucky Jeanne Chowning, PhD, Fred Hutchinson Cancer Research Center Christine Cutucache, PhD, University of Nebraska Omaha Robin Fuchs-Yong, PhD, Texas A&M University Paulette Jones, PhD, Meadowlark Science & Education Brinley Kantorski, MS, Duquesne University Melinda Butsch Koviacic, MPH, PhD, Cincinnati Children's Hospital Lisa Marriott, PhD, Oregon Health & Science University Kelli Qua, PhD, Case Western Reserve University Carla Romney, DSc, MBA, Boston University Virginia Stage, PhD, East Carolina University Gwendolyn Stovall, PhD, University of Texas at Austin Jennifer Ufnar, PhD, Vanderbilt University Nathan Vanderford, PhD, MBA, University of Kentucky J. Michael Wyss, PhD, University of Alabama at Birmingham Debra Yourick, PhD, Walter Reed Army Institute of Research

Cooperative Agreement Program Management

Tony Beck, PhD, Program Director, Science Education Partnership Award (SEPA), Division for Research Capacity Building, National Institute of General Medical Sciences, NIH

Conference Support

Funding for this conference was made possible by the Cooperative Agreement U13GM129167 from the National Institute of General Medical Sciences, the National Institutes of Health. The views expressed in written conference materials or publications and by speakers and moderators do not necessarily reflect the official policies of the Department of Health and Human Services; nor does mention of trade names, commercial practices, or organizations imply endorsement by the U.S. Government.

Report prepared by Genetic Science Learning Center, University of Utah

Dina Drits-Esser, PhD, Assistant Director of Research and Evaluation Steve Reest, MLS, Program Assistant Louisa A. Stark, PhD, Director

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Conference Schedule

Each conference session was 1 hour with an additional 30 minutes for informal discussion.

Monday, November 9: 2:00 - 3:00 ET Town Hall: NIH SEPA Program Updates

Presenters:
 L. Tony Beck, PhD, Program Officer, Science Education Partnership Award (SEPA), STEM Interactive Digital Media (SBIR/STTRI)
 Nancy Moreno, PhD, Baylor College of Medicine

Monday, November 9: 3:30 - 4:30 ET Informal Science Education Facilitators:

Jeanne Ting Chowning, PhD, Fred Hutchison Cancer Research Center Louisa Stark, PhD, University of Utah

Tuesday, November 10: 2:00 - 3:00 ET

Research and Evaluation Facilitators: Kristin Bass, PhD, Rockman et al Dina Drits-Esser, PhD, University of Utah

Wednesday, November 11: 3:30 - 4:30 ET Teacher Professional Development

Facilitators: Marnie Gelbart, PhD, Harvard Medical School Virginia Stage, PhD, RDN, East Carolina University

Thursday, November 12: 2:00 - 3:00 ET

Research Experiences for Students and Teachers Facilitators:

Nathan Vanderford, PhD, MBA, University of Kentucky Louisa Stark, PhD, University of Utah

Thursday, November 12: 3:30 - 4:30 ET

Programs for Students Facilitators: Carla Romney, DSc, MBA, Boston University School of Medicine J. Michael Wyss, PhD, University of Alabama at Birmingham

Town Hall Slides and Transcript









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	SEPA funding credit text for science center and museum exhibits should be		September 10, 2020
	clearly displayed and consistent with the following text:		College of Veterinary Medicine launches League of
	(SEPA), Grant Number, from the National Institutes of General		Vetantinanz to ulversity veterinary workforce
	Medical Sciences (NIGMS), National Institutes of Health (NIH). or		Here is journalistic Metricogale of the Velaboranez are available for journalistic to now als <u>Georgia Drive</u> . Instantials studing compose should follow <u>skaller</u> beet its gefeitives.
	"The exhibit described is funded by a Science Education Partnership		The league will be supported for the next five years by a \$1.35 million grant from the Science Education
	General Medical Sciences (NIGMS), National Institutes of Health (NIH).		Partnership Award (SEPA) program of the National Institute of General Medical Sciences of the National Institutes of Health.
			The Leadue of VetaHumanz expande upon an existing SEDA funded program This is How We "Pole" which
	Post-award monetary support from foundations, biotechnology companies		was designed in 2015 to increase awareness of the role that veterinarians play in keeping people and
	or other entities for SEPA-funded projects is welcome and should be listed		their animals healthy. This is How We "Role" has chapters in 20 states. The program received a 2020
	in website and media credit text or exhibit credit signage as being "additional funding from" or "follow-on funding from".		Inspiring Programs in STEM Award from INSIGHT Into Diversity magazine.
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	September 10, 2020		By Victoria Coats
	College of Veterinary Medicine launches League of VetaHumanz to diversify veterinary workforce		
			There's nothing quite like a global pandemic to turn a museum professional's thoughts to informal learning and cultural—it's about our bodies, behaviors, and com-
	Note to jearnability Photographical the Volumence are available for prevaintie to use via Georgie Drive. Journalists visiting compass should below <u>visitor</u> hasth guidelines.		experiences about health and wellness. At the Oregon Museum of Science and Industry (OMSI), we have been went further than simply creating in English and translating
Г	The leadue will be supported for the pert five years by a \$1.35 million grant from the Science Education		fortunate to receive funding for innovative health science to Spanish. Exhibit activities were co-developed bilingually exhibitions from the National Institute of General Medical criteria (MCMC) Experts for the Detrachic August and biculturally by exhibit developers for Erickson and Verderike Midea For example for the potential of the second second and the second seco
	Partnership Award (SEPA) program of the National Institute of General Medical Sciences of the		(SEPA) program for many years. The SEPA program funds activities were chosen to reflect both cultures. The exhibit pre-kinderearten to read 12 formal and informal science. team worked directly with local researchers. clinicians. nu-
	National Institutes of Health.		technology, engineering, and mathematics (STEM) educa- tional projects that support mission areas of the National the activities.
	The League of VetaHumanz expands upon an existing SEPA-funded program, This is How We "Role," which	ļļļ	Institutes of Health (NIH). Initial surveys of visitors at a variety of small museums
	was designed in 2015 to increase awareness of the role that veterinarians play in keeping people and		Since SEPA began funding informal science education in revealed that our audience could accurately describe 2000, OMSI has received five awards. All of our projects healthy food choices and recommended levels of physical
	their animals healthy. This is How We "Role" has chapters in 20 states. The program received a 2020		produced interactive STEM exhibitions for yourn and raminy activity. Ine challenge was in the application. In response, audiences. Over the years, we've experimented with differ- we created exhibits about identifying and overcoming
L			fited from the requirements of the SEPA program to build game exploring the emption of eating. Visitors guide a partnerships with biomedical scientists, work with diverse that are the requirements of the separate of the set of the
A			audiences, address health disparities, and conduct rigorous response how the character is feeling. At Supermarket Nu- evaluation. Every project brings us new knowledge, builds trition, visitors choose foods to make a meal, scan them at
- Co	NIH) before i hubbe ef Ceneral Marcula Sciences		fruitful relationships, and furthers our practice. the "grocery store," and receive feedback about the meal's nutritional value and how to improve it. Eat Well, Play Well
7			Science Education Partnership Award (SEPA)
1)	Project landing page at www.nihsepa.org		Preprint Materia Accelerating Access: Health Science Education in Native Tor Water Information
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	The SEPA website must be launched within 6 months from the		with the second se
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Informal Science Education: Discussion notes

Breakout Room Discussion Questions

- What programming worked well?
- What challenges did you face and how did you address them?
- What lessons did you learn that would be helpful to others?
- Did you encounter any **barriers** that felt unsurmountable?
- Do you have helpful resources you would like to share?

NOTES FROM EACH BREAKOUT GROUP

GROUP 1

Notes from Discussion

- Informal Learning included summer camps, after school programs, museums
- Content was converted so it related to COVID-19
- Used drop-off supplies for the lessons educators were remote through Zoom; kids participated in person at community center (40 kids)
- Social distancing is difficult for most programs, but partners are willing to host or have new people come into their facilities
 - Modifying program elements to virtual or to a more independent delivery is a solution
- Difficult to engage kids virtually (especially older students)
- Vet students too busy, with their adjusted/split schedules, to volunteer
- Some programs lost all of their interns over the summer, facilities were all shut down
- Low-cost kits are working activities to do remotely (without a lab)
- Investigating remote role modeling others working on it already (focus groups), STEM assessment development tool designed to give immediate feedback for the programs i.e., what feedback do you want to know about yourself to promote your science career?
- FoodMASTER had parent engagement with the activities they sent out
- Having relationships in place meant that people were anxious for the activities to come that they could do at home even grandparents.
- Scientific community seems to be embracing the new technologies that we are now required to use which is opening up more diversity in delivery and, at the same time we now have so much more to learn about using these new technologies
- Mixed synchronous and asynchronous delivery- audience varies with what they need and what works
- Cultural needs of participants include dual language learning

Top Recommendations

- Website Cincinnati we engage for health (content converted to be related to COVID)
- Short and asynchronous seems to be the new standard (but still measuring)
- Across state lines and including kids we wouldn't have had with us in the past, entire families becoming involved
- These new delivery technologies mean there are so many new things to study!
- Could we work together to help get these new protocols through our IRBs?

GROUP 2

Notes from Discussion

- After school programs curtailed due to COVID rules. Now using ZOOM- not terrible OK. Dropping off materials the day before is working, but not the same. Better than nothing, but students don't get the attention from the vet students like they did under previous program.
- Face to face interactions are now remote; students are getting used to it. Cow eye dissections at Boys and Girls Club this week will be challenging, but there will be staff members to help them. Ratio of 2 staff for 9 students.
- Summer program was pretty successful. Participants were assigned a cohort. However, because they were not able to get kits or equipment, they lost the hands-on aspect.
- Teachers helped build the curriculum
- What can we offer that isn't overwhelming for the teachers? Professional development is too hard for the teachers. Should focus on alignment with the standards and not be seen as something extra.
- Virtual Webinars should be offered during the school year in addition to summer programming to avoid overwhelming teachers.
- Previously there were lots of hands-on, minds-on in person labs more difficult now without these options. Talked about virtual sessions and gathered feedback on pilot lessons. Asked about needs - they didn't know because there was so much uncertainty. Group was interested in instruction January - June. Need lab (virtual) hours. Don't want to lose teacher base. Trying to reimagine.
- Continued programming. Hospital program for high school students went virtual. In-person
 program transitioned to be virtual kits. Organizers came in person to create the kits to give to
 the scholars. However, they are dealing with screen time burnout. Offered virtual college tours;
 STEM Day virtual STEM event with Lockheed Martin. Provided candy for experiments, baking
 soda, vinegar. Packets included all of the instructions and materials.
- One and done, or more high-tech for people to return?
- Help people with the GRIT to keeping going. Call families to see how they are doing.
- Kit loan program for teachers that have transitioned to do demos they can record. Currently teacher returns the material resulting in longer wait time.
- Make sure kits are available. Lots of people are competing for the kits. For plant experiments, not all students have access to a place they can do the experiments. Keep things simple and be aware there are less than ideal circumstances.
- Convert summer program into virtual. Had a five-day program pre-COVID; fifth day they had a mobile lab. Foodborne Disease Outbreak module was post-COVID earlier data has not been validated. Preparing a second module Immunotherapy. Working with teachers who want self-contained modules.

Top Recommendations

- Make sure you communicate with your stakeholders!
- Kits keep them simple and plan for the unexpected
- Resources and availability, people might not always have the things we think they will have. Need both technology and internet.
- Surveyed teachers what do they need? Option to opt out. Gave people options and ideas to make it easier to respond, but there was a small return of the survey.
- Should we share survey data?

GROUP 3

Notes from Discussion

What we were planning. How we've adjusted.

- Arkansas State University: In person to virtual camps (science clubs, small groups, things that could be done online).
- Seattle Children's: Reformulating module for distribution to the community.
- Working with High School students to pass their entrance exams. Transitioning to virtual workshops for teachers. Starting them up soon.
- Oregon Museum of Science and industry: Developing early childhood exhibit. Museum is closed; hoping to exhibit when the building opens in the spring. Cannot open virtually given the material.
- Mentoring/matching program for scientists and students. Was already run as virtual program in 2020, but working on some changes for 2021.
- Transitioning to sending science materials with meals. Virtual kitchen science camps (Meet on Zoom, go and do the activity, regroup on Zoom to discuss). What will people be doing in the next year?
- The Tech Interactive: Biotinkering Lab. Transitioning to virtual activities and focusing on how to get usable activities to students (what materials can they get? How can we simplify them enough, yet still adhere to our mission goals?).
- How has use of kits been doing? What's worked? What is in them?
 - They have been disposable, and this approach was successful. How do we create successful video interactions with the materials? How do we get parents more involved?
 - Consumable items. Focusing on reaching beyond the local geography.

Top Recommendations

- Think long term since COVID is not going away
- Adapt with innovative online facilitation strategies
- Provide instructions for materials participants can find themselves at home
- Take advantage of available school/community physical sites for distribution
- Get families and parents involved

GROUP 4

Notes from Discussion

What worked/didn't work:

- Sue: 1) Difficult to get larger numbers of students; 2) more people from far away/ additional professionals able to participate; 3) Currently trying to work with other community groups; 4) schools were helpful in delivering some materials; 5) partnered with mobile farmers market to deliver fresh food to parents while staff handed out activities to kids
- Summer camp (Veterinary): 1) able to get some interest virtually but not as much in the past. 2) participants will attend the workshop but don't use materials; 3) students were overwhelmed with what they had to do; 4) students showed up to schools and worked in the parking lot to access internet; 5) made professional development asynchronous so teachers can choose content
- UMB CURE Connections: secured additional funding to provide Chromebooks to student participants
- The Museum of Science and Industry, Chicago (MSI) 1) teacher professional development programs went online; 2) there was an impact on staff due to COVID related museum closures;
 adapted programs for the public, which were well received; 4) summer camp-created physical

kits that families could pick up and take home; 5) There were issues with USPS mail delivery

- Montana Tech: 1) going into schools and doing work with Phage Discovery (pushed some visits to spring to give teachers time to see what classroom access was like) 2) doing work with teachers
- Challenges: people are tired of Zoom so engagement is a challenge; connectivity- have to go somewhere else to get internet access, and access to devices is a challenge

Top Recommendations

- People are sending materials to overcome some challenges related to access; engaging virtually with varied success; synchronously and asynchronously; partnerships are extremely important
- Public Libraries are being used as an outreach option to deliver activities/hands on materials
- More physical kits and activities paired with virtual is a good plan B
- Adapting program lessons to allow parents to implement or student to implement on their own (writing an activity is different for a trained instructor vs for a student)

GROUP 5

Notes from Discussion

Things that worked well:

- Modified activities provided on YouTube to do at home for outreach; and/or kit programs to do at home
- Beginning activities in the classroom with social distancing (some programs only)
- Activities from one program integrated into school curriculum continued to be successful and implemented throughout COVID
- Identifying missed opportunities for rural or other more remote connectivity that with the new skills/ideas being developed due to COVID are potential new avenues for the future
- College aged near peer mentors did a great job adapting content to the online format partly due to tech savviness, partly due to their ability to be engaging in the online medium

Things that didn't work well:

- Connectivity/hardware issues to work remotely in response to COVID
- Teacher burnout is producing a lack of interest
- Hard to keep up with the changes of all virtual/hybrid/physical classrooms; fewer on site activities
- After school program for middle school has had attendance variability-particularly if staying online via Zoom after a day of online school already.
- Difficulty with devising evaluation strategies/determining strategies for improving impact of virtual outreach programs
- Student (staff/volunteers) were not allowed on campus for quite some time-had to revert to other activities.

GROUP 6

- Many programs halted altogether; others pivoted to create online programming
- Co-creation with community members is important for usefulness, buy-in; creation of community advisory board helpful, grassroots communication
- Challenges with access to WiFi digital divide prevented some participation, but extra effort allowed some to overcome; high demand for others; future will likely focus on both virtual and

in-person

- Hands on activities ideal; use of videos with common household items can work well
- Check out We Engage for Health (WE4H.life) and SquidBooks, Brain Initiative challenge
- Pivot to use COVID as a means to share/teach

Top Recommendations

- Co-create with target communities/populations
- Use of video YouTube, Vimeo to inexpensively offer materials
- Partner with other organizations to leverage programming; use of competition to encourage participation/engagement encourage students to create videos

<u>GROUP 7</u>

Notes from Discussion

What worked well:

- Belen Herle, NIH: Short course in genomics one week immersion, audience is teachers (middle school, high school, community college, college). Moved to virtual w/ two months runway.
 - Ongoing contact with teachers helped with redesign (e.g., need for asynchronous learning).
 - Made course family-friendly given that all are home together
 - Lack of printers need for all materials to be virtual
 - High school kids hard to harness with Zoom (eg., dialed back NIH internship outreach)
- Torri Whitaker, Texas A&M: teacher workshops and summer camps shut down able to adapt the curriculum for online learning
 - Reached out to education service centers (regional, part of state board of ed.) in Texas for input on what teachers need
 - Reached out to summer camp locations for input on what platforms to reach out to
 - Hosted virtual teacher training workshops, and 300+ youth through virtual platforms
 - Motivated students to participate. Veterinary students = near-peer mentoring; bribed them (Quizlet and Cahoot quizzes) with mailed prizes (College of Vet Med swag)
 - Very proactive: "we can do the following things (X, Y, Z), do you want to join?"
- Jan Straley, Univ. of Alaska: used first year as a pilot to see what worked and did not
 - Be willing to drop subawards if you have to had to re-tailor programming to fit needs
 - Need to make things fun shipped frozen fish (!) and did experiment testing shellfish
- Katie Nash, Univ. City Science Center: our program is place-based so sent out "STEM at home" kits for both synchronous and asynchronous
 - Need to ship materials to kids logistical challenge
- Caitlin Nealon, Tech Interactive
 - Not distributing materials, instead developing at-home experiences using common household materials
 - Challenges of determining adoption and doing evaluation of online-based activities for the public
 - \circ $\;$ How do you get feedback when your audience isn't pre-defined?
 - Pivoting to more formal educator resources

Top Recommendations

- Ask the audience/user for programming what they need and implement it
- Be flexible and be willing to learn a new platform (e.g., schools not being comfortable with Zoom)
- Lots of materials distribution or using common household goods

- Harness the power of the environment expanding to alumni networks, mentor networks using virtual
- Start top-down engaging parents who may not know the platforms

GROUP 8

Notes from Discussion

Challenges

- Challenge student recruitment & engagement
 - School partnerships, virtual learning
 - Widening disparities (resourced schools doing okay)
 - Technology can be a benefit texting works well with teens; adults/mentors/volunteers more available by phone/zoom
- Challenge consent/assent
 - District-by-district models School IRBs don't always vibe with institutional IRB -- hard getting parent information from schools
 - Getting forms back (physical forms); IRB won't allow phone/virtual consent
 - Challenge young audiences difficult to engage virtually
 - Lean on schools/teachers (use same virtual learning environment) lost control of facilitation practices
- Challenge assessing learning
 - Survey collection virtually
 - Teacher/Class Observations (don't want to invade student privacy in virtual class)
 - Students with cameras off hard to tell level of engagement
- Challenge school closures mean programs don't run
 - o Difficult to setup virtual programs; teachers overwhelmed
- Challenge tech equity (device access, WIFI access, and tech literacy)
 - Chromebooks *UGHHHHHHH*

Top Recommendations

- Teachers grateful for new/engaging resources
- Kits, resources to students that they can use at home incentives (snacks, raffle items) for attendance, consent/assent forms
- Virtual flip to at-home inquiries
 - Cancer prevention behavior/public health projects \rightarrow design an intervention
 - Leverage Public Data
 - Social behavioral research projects related to students' pandemic experience
- Mental Health /community support for students was essential
- Provide Food when possible
- Focused on making new content, developing with the community
- Storytelling students telling their own stories; connecting with their communities, families, etc.

GROUP 9

- Introductions around the table
- Challenges- Native American Reservations- closed borders and no school; 1) communication networks are down; 2) hands on center (for field trips unable to operate normally); 3) virtual shift for camps and activities; 4) teacher partners are overwhelmed; 5) no one is ready for "extra"; 6) misalignment between university and schools; 7) tech availability of partners
- Programming that worked well using technology to deliver content to participants, building

educational content on YouTube

Top Recommendations

- Surveys may find needs; RESPOND TO THEIR NEEDS
- Look at digital / technology as a scale opportunity
- Stand in for them in the lab they can't enter (STEM Avatar)
- Differentiate for bioinformatics
- Can say yes to more people use this as an advantage
- Cross classrooms or groups that wouldn't have been crossed
- Innovate how you use space and resources
- Negotiate to be ESSENTIAL
- What other products/resources are available through SEPA Partners?
- Bring virtual experiences across SEPA

GROUP 10

Notes from Discussion

- Project-based learning model on vaccines and working with middle school teachers
 Barrier is the variety of access to tech resources
- Near peer training of students at local HBCU
- Virtual resources when physical/in-person is not possible
- Providing resources to families, so participants can be included
- "Bags of Science"
- Office hours for youth voice
- Icebreakers to get the students comfortable discussing/participating virtually
- Small groups/breakout rooms
- Varied programming expand what is offered

Top Recommendations

- Send resources when possible to bring hands-on learning home
- Provide opportunities for student voices/agency

GROUP 11

- Difficulties with connection different hot spots, connectivity
 - A lot of interactions in chat
 - Video camera anxiety with lots of cameras off "sea of black screens"
 - Different levels of community partners' comfort w/ Zoom & virtual classrooms
 - The digital divide is real
- Differences in school district guidelines for virtual school
- Figuring out how to do the activities in a virtual setting
 - Anything involving building came in a kit
- Making use of asynchronous components
 - LMS software as a hosting site -- how to create effective content beyond just slides & videos?
 - How to collect impact data in that situation?
 - Leaning more toward qualitative results, essay-based assessments. But that's tough too.
- Security/privacy issues w/ use of recorded Zoom video and IRB
 - Collect student output/products rather than pictures of the participant themselves
 - Creative methods to get rich data without the anonymity issue (no faces!)
 - Example: <u>https://ci3.uchicago.edu/youth-advisory-council/</u>

- Use of virtual classroom infrastructure to achieve greater reach, can contact parents directly
 - How to determine the validity of data?
- Augmented reality deliverables -- making use of people's desire to get outside and away from screens
 - Equity & accessibility -- brainstorm with the advisory team!
 - How to balance priorities?
 - Zoom fatigue, responsiveness to community needs, project goals & objectives

Top Recommendations

- Can use SEPA money to purchase additional supplies for internet connectivity / supplement the resources of your participants
- Consider security/privacy issues w/ use of recorded Zoom video and IRB in detail -- think about alternative methods of data collection
 - Other anonymous student products creative, qualitative, etc.
- Empower students, participants, community partners to create, design, & implement the structures they want within program parameters
- Phone interviews instead of paper copies

<u>GROUP 12</u>

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- Many museums have closed and won't be reopening soon. The Tech recognizes that reopening
 will increase community spread. There has been a pivot to virtual and distance learning, which
 allows them to continue serving their audience while remaining closed. They have been creating
 activities and resources both for a family-at-home audience and for an educator audience (with
 help from The Tech's in-house teacher PD team).
- New challenges: how to get resources to kids, make activities that require minimal resources (especially considering shopping trips are now often limited), keep activities accessible with regards to time and parent help, consider food and shelter insecurities, language barriers. Also, standard museum challenge is to keep activities scalable to many different grades.
- Partnerships with schools can help facilitate access and distribute materials more broadly.
- In NYC, schools are looking for creative ways to engage students such as partnerships with informal institutions.
- An in-house educator team can help to vet materials (especially useful for informal educators, such as at The Tech)
- Learning management system recommendations? There is a need for this.
- At The Tech, good success with social media. Opportunities for collaborative feedback, looking at things that work and things that don't.
- Getting youth to show up is a challenge. Stipends can help (e.g., paid internships), though it's not just because of the money that they participate. They provide opportunities to socialize and connect that don't feel like school with a youth leadership team that is informed by youth development theory
- Build infrastructure that is useful long term. How do you adapt to right now, but also make it useful later?
- Challenge of engaging students, but with the benefit of broadening our reach (silver lining)
 - No need for transportation to sites, especially challenging in low-income areas with more limited access to public transportation
- More parent involvement participation in record numbers!
- Online spaces provide more room to participate instead of posters, they do presentations

- Any joint efforts to collaborate virtually across agencies or across a state? How do you create a new platform for this?
 - Virtual college visits (make sure the college is affordable)
 - Able to get scientists from everywhere. People realize they need to step up more, including graduate students

Top Recommendations

- Partners are very important to figure out current needs!
- Get youth to take leadership roles, have them take agency, let them be part of the decision making
- Step back and build long-lasting infrastructure
- Collaborate in SEPA and share resources. Don't reinvent the wheel. Use SEPA website as a resource

<u>GROUP 13</u>

- U of Maryland Project was a hands-on lab experience in a rural area relating to drug development that had to transition to be fully online. Students had access to university Blackboard platform, and adapted simulation software for many of the lab modules. This worked well because it could engage students and educators could monitor progress.
 - \circ ~ Used commercially available simulations to cover many things
- Michele also used Blackboard
 - Mailed kits of supplies then used Zoom to do activities live
- Reno Also sent out kits, uploaded to platforms, used Zoom for the synchronous engagement
- U of Wisconsin originally hands-on, moved conference and program online, still supplying teachers with supplies for experiments
 - Using students from Film Dept to make extended versions of the experiment for participants to see everything, and to make choices about reagents, concentration, etc.
- The Tech Interactive transitioned to creating at-home versions of in-museum experiences that relate to bio-making
 - \circ $\;$ Also working on educator lesson plans and resources $\;$
- Seattle Children's hard to get evaluation of new curriculum when teachers are struggling to shift to online with everything else
 - Creating videos that are integrated into curriculum but can also be used as stand-alone content
- OMSI has exhibit targeting young children, so it's super hard with COVID situation because hands-on is needed for that age range
- Challenge of how to get feedback Used a google form survey to get a response from students; didn't get a great response from live Zoom focus groups.
- Resources suggestion Google Jamboard, Padlet
- Having the teacher online at the same time was helpful to get students on synchronous events.
- Reframe thinking impetus to try something they wouldn't have done before; being forced to innovate has added a lot of new ideas to programs
- Finding ways to do things virtually means possibilities to disseminate more broadly than with an all in-person model
 - Virtual evaluation of a video online meant that they got a much better sample from across the country (good for a traveling exhibit)

• Can reach more people with content, larger audience

Top Recommendations

• Relating to virus / COVID is relevant now, so kids are interested in the content

GROUP 14

What went well?

- Taking things online
- Doing what you can in this environment (e.g., promotion)
- Provide/emphasize options to make it easier for people to participate who might otherwise be hesitant to commit in this environment (e.g., overwhelmed teachers)
- Note that Zoom time is wasted if conversation is one-way; move that to asynchronous delivery and save Zoom for real conversation and thought
- Look on the bright side: anyone can come to our Zoom PD now. (It takes a lot of time to get it all in a format that works for online, but the pay-off is better reach.)
- Another bright side: You can compare how in-person vs. online works for same basic curricular materials. New research question!
- Things are more adaptable than you might think; you are losing some aspects of your program, but there are other up-sides (e.g., able to reach students further away, students are opening up and making connections with each other, teachers get to cycle through more time and can compare digital vs. in-person)
- People are working together to make things work; that is inspiring

Feels insurmountable

• Equity issues.

Top Recommendations

• Be flexible and ready to pivot to take advantage of new opportunities

WHOLE-GROUP REPORT OUT (lightly edited)

Lisa Aslan: There was a lot of outside the box thinking, and I think all of us have had to do that. So just really leaning into thinking outside the box in terms of partnerships: partnering locally, partnering nationally, internationally, and finding scientists anywhere to come speak to youth. We are boundaryless now in that way, and so we need to really lean into that lack of boundary in an exciting way and a positive way.

I think all of us also found great success in uplifting youth voice and choice in our programming. And really, when they're on Zoom at school for eight hours a day, how do you get them to show up on the weekend; how do you get them to show up after school? So really having your programming be as youth-led and youth-influenced as possible has been a really great tool, not only for the LEAH Knox Scholars Program, but I think for a lot of the other folks in our group who mentioned similar successes there. And then not trying to recreate the wheel. It's almost like we're all kind of in our own world, just feverishly creating everything virtually. And so, I think the SEPA website with the opportunity to share resources should provide a really great chance for all of us to kind of see who's doing what and go there first before we start spending time creating new things.

Jeanne Chowning: Those are great takeaways. Thank you so much for starting us off. And I do think, especially, the point you made about working with our communities that we serve to really figure out how we can best support them in this time is something that I think carries a lot of weight. That's great. So are there other groups that would like to share or build on some of that? There's a comment in the chat about a SEPA Slack channel, or Facebook page, and some support for the idea of a Slack channel. That's actually something that we've, I think, in our work, upped with some of our participants groups, as well, to stay connected.

Chris Pierret: Yeah, our group had a great conversation, it sounded very much like the first one. But a couple of things that came through were people differentiating their approach, where people were instead of thinking about lab-type centric interactions in an informal environment, bringing in bioinformatics (which seems aligned with SEPA and the need), but also reaching out through other SEPAs and saying, hey, we'd like to use some of your tools because we don't have anything, because I'm locked out of my lab. So, I agree and want to say, yes, please get that resource page up and full as soon as we can.

The other thing I wanted to say is that several of us have found a way to scale up through this, and kind of gain ground actually in scale through this changeover, and take it as a potential positive. One of the group members was talking about using an avatar-based interaction where they could make their lab available to those who were locked out of labs and such like that. And so, we've got a lot of different kinds of innovation in that space of saying, digital doesn't have to be just a sum-total negative, it can definitely be something where we move into a positive space.

Victoria Coats: People doing lab experiences have been able to adapt simulation software for their lab modules. And in some cases, that was commercially available, but some people had found free resources. And then there were people mailing out kits and kind of combining that with Zoom, and that seemed like that had worked well.

And another thing that we talked about was that whole opportunity, if you move things online that you've originally done face-to-face, you have the possibility of reaching a broader audience or reaching more people. So, trainings became more available to just anyone that wanted to learn, and doing evaluations, you could broaden the audience that you were evaluating with if it moved to online.

And then some people talked about the challenge of people reaching audiences who have limited access to the internet. And so, one of the responses to that was creating things that were asynchronous so that audiences could access them when they had internet or when it was convenient for them because having live presentations weren't always helpful for that audience.

Anna Thanukos: But one thing that did come up in our group that I haven't heard mentioned yet was the opportunity to address new research questions in terms of being able to compare how a curriculum in-person fares against the same curriculum but delivered in an online format. So, a couple of people in our group had mentioned being able to expand the scope of their research to include that question.

And related to what Vicky said about people who might not have access, participants who might not have access to the internet all the time. Our group did point out as a very serious challenge equity issues in the current environment, particularly when you can't go asynchronous with something. Especially when you need to have an in-person interaction or want these people to participate, and they're just in a very challenging environment where it's noisy or difficult to connect, or they're in their car. Not everyone has equal access to being able to participate in a synchronous virtual event. And we didn't come up with a solution, just the challenge of that.

Michael Pickart: Yes, I would first like to follow up with what Anna and Vicky were both saying on that topic. We talked about, obviously, the issues with connecting with teachers and students in response to COVID and everything. But just to keep spinning it on the positive side, we're identifying these challenges, and the good thing is we're also, a lot of people are identifying solutions that are at least partially workable in the immediate term. And I think it's a great opportunity to continue to think about best practices with technology and these other new tools that I had never even thought about trying to reach certain groups of people with before. And so, our group talked about that a little bit, and it's really opening the door in a positive sense, in the glass half full sense.

Lori Fink put in the chat, "As informal science educators, we are playing a bigger role in the formal education world."

No, the big take-home for me that's something I hadn't thought about before because it was such an assumption is, when our activities are integrated with teacher activities and curriculum already, and when teachers have experience, and are trained and are generally working fairly independently with program-related activities (although there were disruptions due to COVID) that has still continued to work well because the teachers value our participation and are doing those things. So, I hadn't thought about that before, but that's a strength of a program where those activities are integrated as part of a curriculum.

Louisa Stark: Jeanne, I wanted to share, in the session I was in, people were talking about creative ways to partnership. And the most creative one that I heard was one group has partnered with a food truck. Now this is a food truck that takes fresh vegetables to a food desert, and they had partnered with the food truck to get materials out to students and families. And I thought that was very creative, and I wanted to share that idea.

Jeanne Chowning: There's some folks that are saying in the chat too that they would love to hear more about partnerships with formal education. So, I think that might be something that could be a follow-on conversation from this group. That is a new area to explore.

Tony Beck: And my comment would be that we're moving to a new era, so something that you never thought about doing that you can link to your scope of activity is probably doable.

Jeanne Chowning: It is requiring us to be nimbler and more creative and think a little bit differently, and so many interesting ideas are coming out of this time. And I thank you all for joining us, and for sharing your ideas, and for recording them into the document, and look forward to reading about them in more detail, and to seeing you in some of the other sessions later this week, hopefully. All right, thank you, everybody.

PARTICIPANT LIST

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Research and Evaluation: Discussion notes

Breakout Room Discussion Questions

- What programming worked well?
- What challenges did you face and how did you address them?
- What lessons did you learn that would be helpful to others?
- Did you encounter any **barriers** that felt unsurmountable?
- Do you have resources you would like to share?

NOTES FROM EACH BREAKOUT GROUP

GROUP 1

Notes from Discussion Challenges

- Switching from In-class to online challenged fidelity of implementation. This switch also impacted consent video that teachers normally showed in the classroom.
- Contact the classrooms. Over Zoomed and Teachers don't always have time to take on new endeavors. Echoed by other participants.
- Course is under-enrolled relative to previous years.
- Need to cut back on a lot of the activities to make them less time consuming. University students are participating at higher rates. Data science and bioinformatics have become increasingly popular and it's difficult to take on additional capacity.
- Practical limitations of hands-on activities: Differences in classroom presence. Process of converting activities into filmed activities is slow.
- Taking on new activities to meet the needs of distance learning is itself a learning process. Examples: Video production, online games, hands on laboratory.
- Group projects are especially challenging in online format or in a film or showing results, etc.
- Variety of learning management systems.

Successful Strategies and Relevant Resources

- Reach out to members at your institution to get help in development. Example: bring in film department to help with making videos.
- Reach out to teachers to try and customize to their needs. Label the sessions as family-friendly, and make them inclusive of members of the family. Open activities to folks of any age. Recognize the synergy between teachers and parents at this time.
- Asynchronous interactions
- Small science kit construction of simple items for kids to use and formulate questions, etc.
- Focus on how curriculum delivery will work in multiple environments. Use student roadmaps to guide learning: https://drive.google.com/drive/folders/157PDi5PNT9Mybk_Zym_ZSEvXZeM_W/vpD2ucp-sharin

https://drive.google.com/drive/folders/15ZRDi5PNT9Mybk_Zvm_7SFvXZeM_WVpD?usp=sharin g

• Online vs. In-Person effect of curriculum implementation.

GROUP 2

Notes from Discussion

- Evaluation is moving to online space, but connectivity has been a problem
- Instead of meeting as focus group, Sondra LoRe (NISER) uses breakout rooms with additional evaluators so that there can be multiple breakouts (focus groups are conducted for students, teachers, mentors, etc.)
- It's been difficult to go through IRB because IRBs have been so focused on COVID-19
- James Wong (Tech Interactive): Being closed, they can't do anything yet in evaluation, have been shifting to remote versions and thinking about how they can evaluate those (links to google forms? Or other methods?) Won't open space until April so timeline for collecting data has changed. Are considering building in opportunities for assessment for activities.
- Need to modify IRB protocols to consider virtual learning with minors reaching out to parents, but set up as an opt-out feature
- Some programs (Melissa Kurman, Firsthand) have already had virtual surveys. Also doing interviews with teachers.
- Lynne Holden had to get cyber insurance for virtual programs. 1-2 college students are always reviewing the chat and monitoring program. Could use Zoom data on back end (attendance reports, monitoring chat) channel analytic report (location, participation)
- Difficult to know if students are online if they turn off cameras

Top Recommendations

- SEPAs need to address the IRB issues for exempt projects it is harder getting these through compared to others!
- Are there common questions we can ask across SEPAs? This would help Tony bring compelling stories to Congress, etc. This would also speed things up through IRBs if a set of questions has been approved elsewhere.
- Exit tickets of virtual modules
- Evaluation of implementer journals for leaders who have been working with students (using discourse analysis)
- SEPA could have a shared space specifically for evaluation sharing shared community of evaluators where they can share resources
- Software: MIRO was mentioned can use it to do real time collaboration, can create various boards and voting, etc. It's been great for brainstorming. Jamboard and Padlet were also mentioned but MIRO has more features.

GROUP 3

Challenges: For school-based projects

- Halted in the implementation phase
- Curriculum mandates pushed SEPA projects out
- Projects are dealing with incomplete data
- One approach is to circle back as school opens, but unpredictability of cases makes it hard to plan
- Need to re-train teachers
- Attendance is low even once schools open given remote and hybrid models

Challenges: For community-based projects

• There are challenges with conducting focus groups remotely

- For projects that use high-tech participants, one issue might be engagement, but for projects that use low-tech participants, another issue is to consider ways of bridging the digital divide.
- One person shared that their web simulation project was delayed a semester because they were using external program developers who had to prioritize health and family

Recommendations:

- Grant extensions are needed because the preliminary data (based on the data in current form) may be lacking
- Another recommendation is maybe to engage with homeschoolers who are used to the remote model
- Graduate students who can work in breakout groups help to increase engagement with students
- Use of commercial products for web-page simulators
- Pls are trying to prepare and plan as much as they can while waiting to be able to resume data collection

GROUP 4

Notes from Discussion

- Partnerships with schools, other programs, teachers need to strengthen the relationships
- Programs paused for COVID; working to find ways to update activities to be done via distance/multi-modal
 - All stages: development, implementation, data collection may be an advantage for some programs in development process (e.g., broader reach in online format)
 - \circ May have more time to interact with some teachers/participants due to COVID
- There are existing online assessments or materials, others have pivoted to online
- Human subjects: Students declining consent, other needs/reasons to update the consent information or approach
- Security issues with access to digital classes (e.g., Need district email to access the Google Meets)
- Modifying instruments for in-person and online so they are valid and can answer research questions
 - Observation instruments easier in the online format without travel, but permissions may be difficult/different
 - Conversations look different on Zoom than in a classroom (e.g., in a Google doc vs. in class), which impacts the quality of interactions
- Recruitment within some programs going well
- Equity issues related to connectivity for students in different household settings/capabilities
- Balancing different schedules/organization for different schools
- Modalities synchronous vs asynchronous; student preferences

Top Recommendations

- In planning
 - Think about instruments that are nimble between in person and digital; think about consent process
 - Think about what needs to be kept online even post-COVID
 - Have a back-up plan
 - Create lessons that can be adapted/different formats figure out what's successful for teachers
 - Decide how to have rich discussions in an online format

 Go from pre/post to looking at things more as a case study; be creative in the kinds of data to collect

GROUP 5

Notes from Discussion

- Identify resources and spaces available for students and community members during social distancing.
- Administrations have not allowed in-person or on-site programs. Find online (IT) resources (ex. Labster) to allow for student activity and discussion. Have capstone presentations at end of program.
- Use Learning Management Systems (ex. Blackboard): give students their own log-in credentials, allow for access to course materials.
- What outcomes are being measured? What data is being generated?
 - Getting high school students excited about futures in biomedical research.
 - Inspiring students, but it's difficult to know what those indicators are; it's hard to tell if student responses are just to please educators.
 - Science Learner Identity do students feel that they are science learners?
 - Attitudes toward science
 - S-STEM: <u>https://miso.fi.ncsu.edu/articles/s-stem-survey</u>
- Issues with access to virtual classrooms, restrictions for in-classroom evaluators, concerns for teachers' capacity to accommodate external evaluators
 - Build surveys in a physical lab notebook. Use Likert scale to ask "How do you feel about this topic?" Before and after lesson.
 - Capstone projects (ex. poster session), with invited scientists, to allow students to share ideas and encourage them.
 - Online surveys with reminders. External evaluators will follow-up. Strong commitment from teachers is valuable.
- How are we analyzing the data?
 - Use external evaluators to help assess data.
 - Important metric: Returning participants, students or teachers that come back to the program.

<u>GROUP 6</u>

- Karen -- Was not able to do evaluation on student outcomes. How did others deal with evaluation in the pandemic?
 - In Maine, things were pretty difficult to follow at the end of last year. Not much better this year because teachers are so busy.
 - Mary, from NY has a similar situation. So much diversity. One difficulty is that teachers cannot share equipment (in the past, shipping equipment to schools was a major part of the program).
 - Wheeling -- program is focused on natural disasters so, shifted to focus on PBL related to the Pandemic itself. Program is completely remote - focused on ethical issues. Not collecting evidence related to students, just interviews with teachers.
 - Nathan -- Kentucky ... "we can't get into schools." Teachers that they have worked with before have said "Not right now."
 - Utah -- Program plan was for students to come on campus that didn't happen so, focused on using social media and working virtually with students using Instagram to reach kids.

- Wheeling -- switched to qualitative work
- One program, using incentives, sought to get students to respond to surveys and got no response
- One program is working with early career teachers and finds that they are so overwhelmed that they don't get much response. This was always the case to some degree but is much worse now.
- Question about Qualtrics vs Redcap

Top Recommendations

• Use social media, especially Tik-Tok, if gathering data from kids With teachers, be patient -- understand the spot they are in

GROUP 7

Notes from Discussion

- What programming worked well?
 - Professional Development: PD for teacher online. Week-long online adjustments were made as all day on Zoom was not as effective. Two hours together and then individual work. Met again as a whole group to wrap up. Feedback was positive from teachers
- What challenges did you face and how did you address them?
 - IRB approval from school district. Wanted to know why we couldn't delay, adding new personnel, assent and consent forms
- What lessons did you learn that would be helpful to others?
 - Be prepared to be flexible.
- Did you encounter any barriers that felt insurmountable?
 - Topic of curriculum for grade 8 students was about outbreaks. Our cohorts of students are different. We are unable to compare the two different groups. Gathering participants for the comparison group was challenging during COVID.
- Please share relevant resources, if any.
 - Surveys online: What worked well? Giving a link to survey. Efficacy depends on the program structure. Concerns: In person there are students that need extra help. There are some software programs that can help track attention. In general, online surveys seem work okay.

Top Recommendations

- Plan things with flexibility.
- Online everything takes longer. Teaching takes longer, build some extra time.
- Be prepared to change things around.
- Many methods that are used in-person can be done online. Be understanding with issues, especially tech issues.
- Add tools, types of questions, time markings (i.e. when a question takes 10 seconds, when it should take 3 minutes)
- Using online surveys to help with data collection.

GROUP 8

- Project timelines rearranged (ex: moving activities from year 5 to now, for example) to accommodate for COVID requirements
- Moving to virtual models → opportunities and barriers
- How to hybridize in-person training and evaluations -- some schools are in-person, some are entirely virtual, and everything in between
 - Opportunity to move project activities and instruments online

- Poor response rate with online surveys -- no captive audiences
 - One way people have addressed this is by having community partners (teachers) distribute those surveys
 - Teachers are compensated for this
- There is very little/no in-person interaction happening among project teams right now
- Focus on alleviating burden on teachers
 - Many teachers have varying levels of comfort/ability with tech
- With rearranged timelines: how to continue paying evaluators during the no-cost extension?
- How to make the virtual outreach more engaging & equitable?
 - Many students participating via mobile device
 - Ask the students! They have a ton of opinions and are now EXPERTS on virtual school!

Top Recommendations

- Prioritize taking the burden off of both teachers and students for participation, adding value through curriculum with low barrier to entry
- Look into Administrative Supplement for funding for rearranged project timelines <u>https://grants.nih.gov/grants/guide/pa-files/PA-18-591.html</u> ← ask Tony about this!

GROUP 9

Notes from Discussion

- Challenges around switching to virtual
- Relying heavily on google analytics, Zoom login, YouTube data to get a look at how people are using the content that they're producing
- Partner with other groups to distribute material
 - Limitations on surveys as federal employees
 - \circ $\;$ Also, there are restrictions from IRB about collecting video data over Zoom $\;$
 - o Potential alternative: go through university telehealth systems
- How do we collect data?
- Ethics of research through Zoom. IRB
 - Use telehealth resources to get around Zoom
 - Use the good old-fashioned telephone more of a personal connection and people are tired of Zoom.
- Look at social media analytics to understand number of engagements and depth of engagements
- How do we get around the digital divide?

Things people have tried

- Calling and recording phone calls (more anonymous, able to open up, people less on display during conversations)
- Starred surveys
- Incentives/competitions for responses
- Building online communities
- Looking for LMS equivalents/portals to build in assessments, require a pre-assessment completion to get access to content

Top Recommendations

• Would love to be able to partner with other groups/SEPA programs about not re-building the wheel re: evaluation platforms or initiatives

GROUP 10

What is going well:

- Breaking people down into smaller groups of subjects (small virtual rooms)
- Better response on surveys via email
- Some partners are more accessible. Can do more in-depth interviews and focus groups with people who are typically traveling
- Evaluator could help think through shifts in what the program is trying to provide
- We were able to get more in-depth feedback on the website and online possibilities because more people are going virtual
- Also, able to have more review of curricular materials.
- Evaluators can facilitate an external review of the products (knowledge from the field. A Lit review that is contained within a person). What does the field see as valuable in our products and programs?
- Denise's program is just starting. They were able to shift the start date.
- Lindley: have been able to adapt our program to address COVID. Also relevant to other species.
- SFHI program is based on health research and messaging to different communities. Students who had completed that module were now the experts in their communities. Empowering.

Challenges:

- Jackson lab: We were going to be doing classroom observation of lab equipment and lessons. The entire study has to be suspended and regrouped to do surveys of students that did the labs in the fall.
- How to do observations and rethink the observation process and IRB concerns that go with adapting for this in a different way
- Data proxy hearing back from parents about what students are enjoying
- Going online changed the purpose of the project (connecting with people role modeling / mentoring) rethinking how the program is working on the new delivery more/changing approaches

Barriers

- In-person labs. Implementation of lab portion of curriculum is not happening as much. Don't have a big team to develop animations and move the lab experiences so that they are accessible.
- Partners we work with are overworked and stressed. We try to only be helpful and not overburden them.
- Reservation communities we work with (in some cases) have borders that are closed. Schools are struggling to provide access. Extremely underserved and rural. Even if we did have a program online, not accessible. Have to communicate and coordinate really well. There is also a cultural component trust.

<u>GROUP 11</u>

Challenges

- IRB approval
 - Signed consents to use data moved from paper to electronic
 - Teachers emailing parents

- Students not giving e-consent
- Remote Evaluations-Getting an unbiased group overcame by:
 - Broadly canvasing community
 - Using incentives
 - Adding community member to advisory board
- Science Cafes group hubs moving around to survey mixed populations of public/academic
- Overwhelmed teachers had no infrastructure and needed virtual resources
 - Team meetings
 - Brainstorming
 - Lower sample sizes due to decreased density of onsite programs or virtual
 - Sample size n=60-120 students
 - Situations are variable in classroom
- Delivering teacher professional development
 - Onsite not allowed
 - Zoom fatigue
- Bringing people together beyond NIH SciEd
 - Database of all teachers involved in SEPA
 - Working groups
 - Database of tips and tricks
 - See SEPA website for dashboard of active SEPA's

GROUP 12

Notes from Discussion

Challenges

- Changes in the program "what can we measure now???"
- Evaluation is on hold so many unknowns with closures. Was it just a pause or a full year closure/re-do?
- How do we learn something positive from this? Can we even compare this to in-person?
- Exhibit has to be interactive with early childhood kids, so we can't get around that (insurmountable?). Seeing if we can work with community partners who are in-person even through COVID
- Being early in the process meant we could expand the needs assessment portion and make changes

Lessons learned

- Make data collection more interactive with quizlets, emojis etc.
- We have no idea of who is using our content or how it is going. We are asking for feedback but not sure who is responding.
- Need to have websites set up to do this all virtually (new challenges across institutions)
- Some programs have shifted to more virtual training (now being allowed/supported more than in the past) our needs assessment is supporting that this is what the participants want
 - Paper coming out (Karin Chang) about the top 10 sites high school teachers use to supplement their lessons and why they go there!
 - Teacher stress everyone is hearing it...

Resources

• Quizlets (Quizizz)

- Poll everywhere/poll anywhere
- Play posit
- Teaching channel videos aligned to NGSS

Top Recommendations

- Question we are all asking "What can we measure now"?
- Make data collection more interactive especially for kids (quizlets)
- Teacher-specific content is easier to get feedback on during this time (than general community)
- Allowing more virtual training within the projects has helped asynchronous and synchronous
- Zoom transcripts makes it easier one positive
- Add engagement measures to anticipated outcomes

WHOLE-GROUP ZOOM CHAT

Karin Chang: Here is the link to the student engagement measure - must be adapted for online environment <u>https://journals.sagepub.com/doi/abs/10.1177/0013164408323233</u>

Barbara Hug: Districts saying no research or evaluation

Samantha White: Group 9 spoke a bit about relying on website analytics (org websites, virtual meeting platforms, social media) but realizing the data doesn't help answer questions about the depth of engagement and impact following engagement...

Sandra San Miguel: Group 11 also talked about ways to come together throughout the year to share tips and tricks when encountering common challenges and capturing those tips in a database or FAQ.

Carolyn Cohen: One person in our group also said that once they started using online consent, students were much more likely to refuse.

Victoria Coats: Impossible to evaluate hands-on, free choice learning environments—like science exhibits.

Caitlin Nealon: I would love to hear plans from any SEPA programs that were planning to be digital-first initiatives. Would be great to share quick overviews of their approaches across the community to give us starting places.

Jan Straley: Advice for new SEPAs is to have an evaluator with SEPA experience.

Louisa Stark: Do people want a place to share evaluation instruments and methods publicly? Or do you want a SEPA-only place?

Cynthia Alcantar: Speaking as someone new to this, it would be great to see ideas.

WHOLE-GROUP REPORT OUT (lightly edited)
Sarah Wojiski: I'll jump in and just make one comment. So, one of the things that came up in our conversation was, how do we make lemonade out of lemons? And we're all definitely turned on our sides with what happened with COVID. But one of the things that seems to come up consistently is that it allowed for opportunities for maybe more intimate or deeper dive evaluation opportunities with either partner institutions or program participants that you normally wouldn't get because of geography or people's busy travel schedules or whatever.

Nobody's really traveling and now it's not such a big deal if you want to talk to somebody on the opposite coast because you can just set up a Zoom call and you don't have to try to arrange an in-person meeting. And so that has allowed for actually more opportunities for things like smaller, intimate focus groups, or one-on-one interviews or things like that, that give you a little bit of a deeper insight into some of the nuances of your program and what's working and what's not, that you maybe wouldn't have been able to get through the typical evaluation plans that may have been in place.

Speaker: We have experienced kind of the same thing. We're doing a focus group. Maybe online with a group of students was sort of novel before, we'd get lots of interaction if we had nine or 10 students on there. Now they're so virtual burnt out that we found that we're taking what would be a larger focus group and dividing it amongst using the Zoom breakout feature, maybe talking to two or three students at a time, which means we either need to have more meets or we need to engage more evaluators. So, it's made us think about budgeting our time and how we're going to do these things and change our evaluation workflow. But it is richer, deeper data if we can break those, what would typically be a larger focus group, into smaller interviews. So, we've had to be creative with the funding and how we do our evaluation for that reason.

Bill Zoellick: I think that most of the discussion did focus around the effects of COVID on evaluation and more than on evaluation, really. The group also talked a good bit about just the effect of it on actually executing the programs and making them happen. It varies from state to state, but in a number of the states, there's a lot of diversity, there's a lot of schools open, closed, with hybrid schedules and I think that the group generally agreed that mostly teachers don't know what's going to happen next week. And so, they're hard to get access to. If the focus is on students, there's difficulty getting in touch with them because the students are more scattered than they used to be.

And if your focus is on getting in touch with teachers, they are really, really busy and yeah, so those were the takeaways. The sense of warning us all, reminding ourselves to be patient came up and that these teachers they're in a tough spot. I'll just sort of say in the work I'm doing with Mount Desert Island Biological Laboratory, we are also finding that the small group work is pretty effective. It's often just two or three teachers. We have a lot of difficulty getting very many teachers together, but once we do get together, there were really rich conversations. So that's kind of latching onto what other folks had just said.

Mike Wyss: We talked about the insurmountable IRB's, especially when we had changed to virtual. Can we get instruments together that we can use over several projects to give NIH a little better understanding of what these projects are really doing? And had we had that with yours, Kristin, we could have said to the IRB, these are already approved by whoever and it might be less of a barrier, plus we'd have common instruments to use. So, I think that's something we ought to look at for the future of assessment. It's certainly been something that we've had conversations about during meetings and the urgency may be even greater now for the need to streamline, for the need to get things through quickly. So, I understand that point. I appreciate that. Others have encountered an insurmountable barrier, or maybe something that you didn't expect would happen with regards to your evaluation around COVID,

but were surprised that it happened, something maybe positive besides the small group interactions that we've already heard.

Tony Beck: To bring up Mike's point, back in 2006, something called the General Clinical Research Centers (GCRC) were converted to the Clinical Translational Science Awards, CTSA, which is a \$580 million program. One of the things Anthony Hayward, who ran the program was trying to do, was have a common IRB for everybody because they're all doing clinical trials. I think this is a wonderful idea because some IRB's, they don't understand STEM education. So, this is something I'd love to think about because I'd like to do anything we could do to get a commonality for as many groups of SEPAs as we can. And even if it's something the IRB may not want to accept from another institution, at least there's some history to it. So, I think that's a great idea. I'm glad Mike has volunteered to help us work on this effort.

Mike Wyss: I think Tony, the other thing you may not realize, not being in the business, but especially with COVID everybody's IRB protocol review took much, much longer because COVID was prioritized. That's fine. But when we've gone to this brand-new exempt policy at NIH, it's much harder to get the exempt through than almost a full, and it's amazing that you make an exempt category and then make it more difficult and a lot longer to get it through. Yeah, it really means the IRBs do not understand what an educational grant is. They really don't. And they do essentially a full IRB review on everything.

Carla Romney: And I'll just echo, kind of adding on to what Mike was saying about the exempt. If for those of us that had exempt protocols already in place, you can't amend them. And so, it meant starting all over with IRBs to get new exemptions, to carry out the work that you had been doing in a virtual format, because just switching from paper or face-to-face to online brought up a whole bunch of other security and privacy issues that were difficult for the IRB's to adjudicate.

Tony Beck: And the other problem is NIH has got for the last 10 years, this exclusion monitoring requirement and anything that has human subjects, regardless of what it is, it has to have a process where we put together information. And the NIH says, even if you're claiming exemption E1 you still at some point have to have your local IRB agree with your claimed exemption.

Dina Drits-Esser: I'm looking across some of the groups that were able to record their thoughts. And then some of the patterns I've seen are plan with flexibility, online everything takes longer, teaching takes longer, research takes longer. Somebody talked about data proxies. I don't know if you guys have all probably had some experience with data that you're not able to collect the traditional way to try to learn about your goal in a different way. Somebody suggested making data collection more interactive.

Kristin Bass: And I'm looking in the chat and recognizing the reality that some districts are just saying no to research and evaluation.

Dina Drits-Esser: Online consenting has been useful to us.

Helene Starks: So, the way we had done this before we did online data collection when we were in the classroom, and the way that we were getting consent, was that the teacher was running a short video that covered the consent. And so, then when we moved to the online curriculum, at first, we were sending the extra consent video link separately and then I realized we could embed the consent video in the survey. But what we're finding is that people are not clicking that survey or they're not clicking the

video. So, we're still challenged by this. We are actually to the point where we were just discussing this morning that we might be going back to our IRB and just asking for a waiver of consent, period, in the end because this pre/posttest is being used by the teachers for grading purposes.

So, we're asking them to consent to use the same data their teachers are using for research purposes. And we were just doing an analysis to look at the consent rates since we've gone online and it has definitely gone down because we have no teacher mediating or explaining the role between the curriculum for learning's sake and evaluating the curriculum for learning goals and its effectiveness. So, I would say that the strategy that's good is you can embed things in your surveys. You can embed videos, but you can lead your horses to the water, but you can't make them drink.

With the other thing that we're going back to, we started out with a very strict consenting policy where they had to consent for the pre and the post. And we would only use those surveys where we had two consents. And we're now also considering if they gave us one consent, then we'll take that. So, this is hard because we think that the actual consent process as determined by the IRB, is a little silly in the base case. Although we're trying to respect the students, but it's so twisted in terms of how the messaging goes and what kids understand. So, it really is an attention issue, I guess, and I think we actually have a pretty good relationship with our IRB and they've been fairly understanding. I know that's not true everywhere, but these are just some of the tricks we've used plus or minus. I don't know if that's helpful.

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Teacher Professional Development: Discussion notes

Breakout Room Discussion Questions

- What programming worked well?
- What challenges did you face and how did you address them?
- What lessons did you learn that would be helpful to others?
- Did you encounter any barriers that felt unsurmountable?
- Do you have resources you would like to share?

NOTES FROM EACH BREAKOUT GROUP

GROUP 1

Notes from Discussion

- Northwestern is in year five.
 - Had summer PD with Chicago Publics Schools using district curriculum, aligned with NGSS.
 - Google was the only platform allowed for teachers. They dove into Google products, including JamBoard
 - Tried to get kids outside.
 - Supported teachers in getting materials to students.
 - NSTA had webinar on digital sense-making in a series over four Thursday nights.
- Rutgers Cancer Institute.
 - Program involves hands-on research experience and outreach to schools.
 - Some trainings work well (HIPPA and CITI).
 - Considered hands-on in wet labs, but they are not sure they will have enough lab projects for the teachers.
 - Rutgers also has restrictions in terms of access to labs (and patients!)
- University of Florida.
 - Chose to offer virtual program for students, not teachers.
 - Focused on establishing relationships with a core group of researchers for lab tours and experiences.
 - Cell phones or GoPro cameras were used to record or have live sessions (e.g. veterinarian's surgery on a horse).
 - Prepped them ahead of time to help with coordination (video, filming, etc.)
- Discussed kits and what will work with students.
 - That depends on the courses teachers are teaching.
 - Going to do some surveys to find out the level of interest and capacity. Need to find those researchers who have that capacity.
- Fred Hutch doing virtual field trips-could model their methodology?
- School contexts are so mixed now: some all virtual, some hybrid, etc.
- UW-Milwaukee
 - Creating video versions of experiments with zebrafish.
 - Taking images of development at different stages.
 - Will have a repository of the resources so they can do experiments virtually.
- Teachers have asked for hands-on NGSS-aligned activities to do with materials that are "commonly found around the house"

- Developing modules and assessing existing available modules is time intensive and expensive.
- Univ of Florida
 - Tried Labster. The challenge was that it is a paid service, and it requires a huge amount of bandwidth.
 - Virtual simulations require infrastructure that some districts, schools, and students don't have.
 - How to support the sense-making that goes along with investigations?
 - The more support we can offer teachers and students to make sense of what they are observing and experiencing.
 - How to support the analysis and argumentation?
- Univ of Florida mailed kits.

Top Recommendations

- Needs assessments for teachers we work with. Needs of teachers vary significantly. How can we meet so many different needs?
- Develop a core of scientists/researchers who have the willingness and capacity to provide virtual access to their research/practice
- Could we establish a set of shared resources repositories of modules for virtual experiments?
- How can we ensure the quality of some existing resources (this takes time and money)?
- Combination of synchronous and asynchronous activity seems to work well
- Assume kids do not have anything at home (including adults). Make sure kits have as many materials as possible and are easy to set up.

GROUP 2

Notes from Discussion

Worked well

- Were able to reach more teachers by putting teachers online. Went from 30 teachers to 200+ participants
- Used Canvas learning management systems for asynchronous teaching, so teachers can work in their own time
- Set up small working groups

Challenges

- Since schools did not give access to project participants for organized content with individual schools over the summer, offered individual teachers content that other SEPA programs had available virtually. Had to have individual contact with teachers.
- Evaluating teachers implementing lessons is challenging
- Different teachers have different needs
- All day Zoom is overwhelming

Barriers that felt insurmountable

- Not having ability to hear from other teachers and the in-person networking that usually occurs among teachers
- Lack of in-person downtime, which is when networking happy hours happen
- Teachers are burned out and school districts do not want them to engage in extra activities

Top Recommendations / Lessons helpful to others

• Don't do peer review sessions

- Sometimes stipends are not necessary for many teachers; teachers that want professional development will seek out offerings
- Make sure to have many breaks and use virtual breakout rooms to make groups smaller for synchronous virtual content
- Keep in mind the different levels of access/internet connectivity that others might/might not have when delivering online content
- Asynchronous content works well for self-motivated teachers
- Find out what learning management platforms schools are using and meet schools in the middle when possible for delivering content
- Act as curators for resources and "correct" content for teachers

GROUP 3

Notes from Discussion

Challenges:

- Teacher burnout/student burnout on computer/online learning
- Live animals--how to use them
- How to do NGSS-type learning virtually
- How to move everything online
- Multiple delivery methods in schools
- Inequities in internet connections and hardware/software
- Adapting to Zoom, routers, crashing and getting technical support
- Student engagement online is minimal
- Parents can opt out of sending kids to school so teachers are faced with mixed classrooms
- COVID situation may persist even with vaccine availability--how do we learn from what we have been doing and make it better?

Worked Well

- Built relationships with teachers
- Gave teachers a part in the problem-solving process
- Let teachers have a say
- Used videos of living things rather than bringing in living things
- Kept bi-monthly meetings to 50 minutes or less to help prevent burnout
- Teachers figured out platforms quickly and had support
- High school students built their own inquiry projects worked well for motivation of students
- Asking students what they wanted or what motivated them helped with engagement
- Opportunities for choice can be engaging for students AND Teachers
- Brought in experts to add to activities/projects
- Delivered materials to kids at home or incorporated materials that kids have at home to do activities
- Used real world examples and data to help students buy in and get motivated

Resources

- Flip grid and other online delivery methods
- Near pod
- Ed puzzle
- Pear deck
- If finances for new situation are strained, contact Tony for help with reasonable requests

- There is an overall feeling of finding opportunities in the current environment
- This situation has encouraged PLC collaboration and for teachers to use new resources
- Inequities in districts are more visible, e.g., lack of resources, computers, access

<u>GROUP 4</u>

Notes from Discussion

- Moving workshops online can work, but teachers aren't looking for new content right now -- they are just trying to get by
- There are many inquiries about non-grant-related support from teachers that we have longstanding relationships with. Relationship building will continue to be important in the long run.
- Non-grant support ideas:
 - Virtual field trips with college-aged mentors (who are excellent tech support for adapting to online environment)
 - Time for teachers to be with each other and work together
 - Helping teachers find resources for teaching science online, equitable curriculum, or whatever else they need
- Long-term relationships are paying off
 - o Creating an advisory board of trusted teachers who can advise on current challenges
 - o Partnering with trusted teachers who can help improve PD to meet current needs

Top Recommendations

- Long-term partnerships with teachers are really important and are keeping our programs going into the future
- Keep in touch for the duration and try to provide non-grant support where we can, even if it's just to reach out and say hello

GROUP 5

Notes from Discussion

- Successes/Challenges
 - Created online courses to replace online PD
 - Made recordings of lectures, imported into Google Classroom.
 - Watch presentations on own time, loop back for discussion.
 - Moved to online teacher lab experiences were replaced with curriculum. This helped with collecting feedback.
 - Difficult to engage teachers now because they are overwhelmed & burned out
 - Google Classroom is not great for discussion--created Slack workspace/channel for teachers instead
 - Google Classroom/MS Teams all have access issues for teachers.
 - Used partners for teacher recruitment,
 - Created resources to share and make it easy and interesting for teachers.
 - Online courses have a broader geographic reach
 - o Dissemination is through county school districts, NSTA, NABT
 - Create resources teachers can easily use for distance learning. Ex: http://pged.org/educational-resources-for-distance-learning/

Top Recommendations

• Recruit university instructional designers to help create online classes.

- Build on prior relationships with teachers already involved.
- Use flipped classroom model
 - Create recordings to support lessons
 - \circ $\;$ Teachers work on own time and meet back for discussion

GROUP 6

<discussion notes unavailable>

GROUP 7

Notes from Discussion

- Candice Johnson Southern Illinois University Edwardsville (SIUE)
 - General challenge engaging with students/teachers
 - Student/teacher burnout with less login participations
- Maurice Godfrey
 - Teacher burnout in trying to figure out how to move everything to online learning.
 - Teachers didn't want to do more work over the summer to participate in PD.
- Mary Hickey ASSET Program Cornell U
 - Simplify workshops and work with local state to create better programs and get more follow through
- Sarah Wojiski The Jackson Laboratory:
 - Created an online asynchronous workshop, positive change from all of this.
 - Was able to focus on virtual and online
- Caitlin Nealon The Tech Interactive:
 - Hadn't offered teacher PD previous to COVID
 - Exiting teacher engagement because activities use household materials

Top Recommendations

- Keep as hands-on and physically engaging as possible; apply student engagement principles with teachers as well
- Send materials to teachers/schools to utilize programs
- Include an onsite advocate that can help facilitate at the site for more hands on, even when doing a virtual program

GROUP 8

Notes from Discussion

- Access to teachers and schools was a nearly insurmountable challenge due to disruption in schools; this continues to be a problem
- Evaluation efforts in schools was very difficult or had to be paused/postponed
- Many participants moved SEPA teacher and student resources online, spending more time on curriculum development
- Access to mobile labs, equipment lockers has slowed down significantly
- Some SEPAs have launched virtual fieldtrips, virtual townhalls and mini-medical school events

Top Recommendations

- Several groups have shifted to create virology/COVID content for teachers and students
- Should publish COVID-related education and other resources on SEPA website
- Programs are considering wider dissemination from local to virtual
- Google classroom resources are popular
- May want to consider a SEPA newsletter across community

WHOLE-GROUP ZOOM CHAT

Nancy Moreno: We created inline resources related to teaching STEM activities at home and teaching about COVID-19. They can be found at <u>https://www.bioedonline.org/</u>

Jeanne Chowning: NSTA is always looking for "Daily Do" resources if you are looking for ways to get a smaller lesson or module out there.

Robin Bowman: pgEd has been working on creating a series of "bite size" lessons meant to be completed independently by students in 20 minutes or so. You can see them here: http://pged.org/educational-resources-for-distance-learning/

Nancy Moreno: You can go to www.nihsepa.org for SEPA generated materials across the community

WHOLE-GROUP REPORT OUT (lightly edited)

Speaker: The disruption at the school level put teachers into a position where they were scrambling to do the basic things that teachers do, let alone have enrichment activities that come from the SEPA community, which was disappointing.

Speaker: We had to pause or postpone some critical evaluation things because without, we just couldn't do evaluations with the schools, either shut down or operating in a very disruptive manner. Just to keep it quick on the recommendations, a bunch of groups created on the fly COVID or virology related resources that they stood up and we think that these kinds of things could be shared on the SEPA website. A bunch of programs used the opportunity to spend time doing curriculum development and to develop online resources.

Speaker: In our teacher communities, it looks like Google Classroom is a pretty popular platform. So, when asking teachers how we can help them, you create a bunch of resources online and be flexible with giving them the resources in the format that they want, which might be through Google Classroom, Google Sheets, and so on.

Speaker: I can say a couple of words for group one. We definitely discussed some of the issues that were just brought up with group eight and we were in different stages of course, in our SEPAs, but we started having a conversation about how to provide really hands-on research experiences for teachers and students and what works well for wet labs, because there are a lot of simulations and things that you can do online. They have issues and challenges like limited bandwidth, but there were some creative ideas for how to partner with laboratory research scientists, University of Florida, I believe it was, please correct me if I'm wrong, was working on establishing relationships with a core group of researchers who would be willing and have the capacity to sort of provide an inside view of their laboratory work with cell phones or GoPros.

Someone had a veterinarian provide a window into a surgery on a horse. So, building up that community or establishing relationships with a core group of researchers who could help share their practice was an

idea and then we started talking about kits and how our programs are distributing kits to teachers and how schools are distributing kits to students and some of the equity challenges involved there. And then there were also questions about how we can sort of ensure the quality of some of the existing resources that are out there for virtual learning, which are research-based -- how we can share recommendations of those and, we talked about really needing to do needs assessments for teachers because their needs vary significantly. And maybe the SEPA community could communicate and establish a set of shared resources for virtual experiments or lab experiences. Also, just being mindful of providing a combination of synchronous and asynchronous activity for teachers and students, so everyone's not sitting online together all the time, and I think those were the main points.

Speaker: I will point out looking across the groups, the needs assessment approach came up a few times where people were discussing potentially the need of stepping back and reconsidering where teachers were and asking them directly, how would you like to engage? How has this changed? How do you want to move forward? As well as what is the best combination of synchronous asynchronous, or even all asynchronous, to an extent, depending on the needs of the teachers?

Speaker: Burnout was a huge theme that ran across a number of your conversations, and there being concerned about teachers not wanting to even engage with new material, because they have so much on their plate right now and everything moving forward seems to be a little unknown. So, buying into a new program could be challenging. There were a number of groups that talked about the benefits of sort of tapping into existing partnerships or existing relationships. Does anyone want to jump in and talk a little bit about that, because that was also a common theme that ran through a number of groups?

Speaker: Does anyone have anything to comment with regards to the modality of delivery? So many groups talked about the challenges of moving everything online. So, with regards to the challenge of putting everything related to your program that does face-to-face online, but then also the balance between synchronous asynchronous. For example, Zoom burnout came up a couple of times. Anyone have any comments related to that? I see heads shaking but feel free to jump in.

Speaker: We kind of brought up those things about building on prior relationships with teachers already involved. One person in our group was kind of new in establishing a program and asking just "how do you get teachers to participate?" and once you get some people in your program, you can kind of keep going back to those people and if they like it, they're going to tell their colleagues and that sort of thing. But also tapping into like the NSTA or NABT, those professional organizations where you can meet a lot of teachers who are going to be interested in the subjects that you're offering resources for. We also talked about ideas of offering online professional development--using Google Classroom, synchronous, asynchronous, and that kind of stuff and we found that this summer we had better participation than anything we've tried to do so far in the fall. I think now that school's back in session, teachers are just so overwhelmed, like professional development is just not rising to the top of their priority list right now. We've found that teachers are very appreciative when you provide them with things that they very easily can plop into their distance learning format, a just plug and play kind of thing, because they've been asked to recreate so much and change so much that anything that's handed to them, they're really appreciative of. One person in our group also suggested to recruit your university instructional designers to help create an online class. If you've never done it before or you don't know a lot of best practices for online education, see if you can get in touch with those experts on your campus.

Speaker: It would be a great idea to try to create stronger connections between the two communities because the SEPA community has so many excellent high-quality, vetted science resources, science

education resources, and NSTA is looking for those to disseminate to teachers who are part of their communities. So, there's some preliminary conversations with leadership of NSTA to try to strategically make that happen, and I think it would be exciting if we could push that forward. When we were going to meet face-to-face, we were trying to involve some of them in our conference and we'll just kind of continue to work that angle and see if we can make that happen.

Speaker: There were a couple of comments as well about some SEPAs tapping into other SEPA resources, particularly ones that were already online and they were able to sort of leverage that. The connection with NSTA would be fabulous. Speaking of resources, there were a number of groups that mentioned specific resources they've used when shifting to the online platform. Was there anyone that wanted to talk about one resource in particular they've found particularly helpful in that transition or at least in delivering professional development to teachers during this time?

I saw one group even talk about a GoPro camera and using that as a recording device for some live activities and a number of people mentioned they have greater reach this way. One group went from 30 teachers to 200 plus. So potentially shifting to a virtual format has expanded people's reach. That's pretty awesome. So, we've got about three minutes left. Are there any last-minute comments or questions you want to share?

Speaker: Genetic Science Learning Center has virtual learning resources. <u>https://learn.genetics.utah.edu/</u>

Speaker: I'd like to bring up a combination of concepts that I saw in several of the sessions. One is I love the idea of the GoPro. It's something kids relate to on a regular basis, whether it's skateboarding or skiing, but in our group, one of the participants talked about moving to a laboratory hands-on real science, but shadowing, graduate students, faculty, particularly the students could be near peer mentors. So I think this is something that I find fascinating and I'm going to bring it up to the NIGM folks because we support a lot of basic research and a lot of underserved communities or states. So real science versus virtual science.

PARTICIPANT LIST

Group 1:

Abbey Thompson, Stanford University Abigail Matela, University of Pittsburgh Cynthia Nazario-Leary, University of Florida Earle Adams, University of Georgia Emily Mathews, Northwestern University Lisa Marriott, Oregon Health & Science University Michelle Phillips, Phillips & Associates Renee Hesselbach, University of Wisconsin – Milwaukee Sunita Chaudhary, Rutgers Cancer Institute of New Jersey

Group 2:

Adam Fagen, Association of Science and Technology Centers

Adriana Brodyn, Ci3, University of Chicago Anne Westbrook, BSCS Science Learning Kathynie Hinds, Dana-Farber/Harvard Cancer Center Liliana Bronner, University of Nebraska Medical Center Molly Malone, University of Utah Orestes Quesada, University of Puerto Rico Regina Ciphrah, Verbalizing Vision, LLC

Group 3:

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Group 4:

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Group 5:

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Group 6:

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Group 7:

Caitlin Nealon, The Tech Interactive Candice Johnson, Southern Illinois University Edwardsville Debra Tyrrell, Wheeling Jesuit University Kelly Furr, FoodMASTER Mary Kay Hickey, Cornell University Maurice Godfrey, University of Nebraska Medical Center Patrice Saab, University of Miami Sarah Wojiski, The Jackson Laboratory

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Charles Wray, The Jackson Laboratory Donald DeRosa, Boston University Elizabeth Parker, University of Maryland, Baltimore Elizabeth Tuck, Genspace NYC Jeanne Chowning, Fred Hutchinson Cancer Research Center Jocelyn Bayles, East Carolina University Manetta Calinger, Wheeling Jesuit University Mary Jo Koroly, University of Florida Ralph Imondi, Coastal Marine Biolabs

Research Experiences for Students and Teachers: Discussion notes

Breakout Room Discussion Questions

- What programming worked well?
- What challenges did you face and how did you address them?
- What lessons did you learn that would be helpful to others?
- Did you encounter any **barriers** that felt unsurmountable?
- Do you have resources you would like to share?

NOTES FROM EACH BREAKOUT GROUP

GROUP 1

Notes from Discussion Challenges:

- Unexpected interruptions due to COVID-19
 - o Difficult to get students to record data on expensive devices remotely
 - o Some students just don't have remote access
- Rewriting curriculum for online delivery
- Atom has noticed that hands-on/wet lab activities turn students off if the activity doesn't go
 well. How do you create an experience that keeps everyone interested regardless of where they
 are?
 - Incorporate iterations in the activities and be up front with the students about how science is an iterative process, so it isn't a failure if the activity doesn't go well the first time.

Top Recommendations

- Possible solutions to some problems include online simulation tools. Anjan found that this seemed to work but hasn't compared hands-on to virtual simulations yet. Participation was good.
- Luis (NYU BrainWaves) moved curriculum online with google forms and interactive videos and figures...allows for a grading tool. Research experiences included EEG and behavioral experiences. EEG couldn't be completed online but https://www.psytoolkit.org/ was a good resource for behavioral experiments. Sample lessons from BrainWaves website, as well as external resources shared with teachers.
- Candice's group rewrote curriculum so that students could do it online. Difficult to lead students through inquiry process when online. Here's what they came up with: http://www.siuestemcenter.org/stem-at-home
- To make activities more successful and keep students "turned on" celebrate the process of science, not the results, so if a wet lab or other demonstration "fails", present it as an iteration, and normal part of the scientific endeavor.
- Show students scientists that students can relate to and their experiences in conducting research which include failures. Atom and Abby have found this is particularly important for graduate students. Can help address imposter syndrome.

GROUP 2

Notes from Discussion

- Built a COVID curriculum, through Zoom, with online mentoring team; agreed upon a research topic/project; did preliminary research in anticipation of fall research
- High school/college students had internship experiences, but needed to have online access at home, Zoom conversations were a required component. Each faculty member/senior staff had to come up with a virtual research component to replace in-person experiences. Instead of poster session, had a Zoom community meeting, each intern gave a three-slide presentation. This was extremely successful but limited in capacity.
- High school programs during summer all virtual, and mostly didactic. Now fall transitioning to research focused on computational biology.
 Had good uptake from research staff to facilitate/mentor student research experiences. School year internship is a new component to the program building out ethics, periodic check-ins, student run journal club is going well. Mentors dictate research projects where students can contribute a component virtually.
- Bringing portable EEG technology into classrooms. Now shifted to behavioral studies, doing computer-based behavioral tests because of lack of access to classroom visits. Students interact with mentors (grad students/postdocs), which now takes place virtually. This is working well. Rather than students collecting their own data or doing their own experiments, now doing demos and asking students to make predictions, or to analyze pre-collected data. Or collecting data from family members, instead of peers.
- Citizen science project examining well water for arsenic. Arsenic awareness education is an important component. Get students/teachers involved in data collection, but low capacity in analyzing the data. Now focus is on building data analysis proficiency. Scientist partners help teachers/students with examining other data points- confounding factors, etc. Most schools in hybrid mode and are still able to continue project. TUVAlabs.com is the data display tool used-drag and drop tool to do visual data interrogations.
- Next summer? dependent upon institution. In-person activities for small groups, still focused on Zoom mentoring. Planning on clinical trials and vaccine development curriculum.
- Evaluation- Zoom is useful for recording
- Opportunities to partner with others we normally wouldn't have collaborated with.

Top Recommendations

- Building in interactions with other lab members aside from mentor attending lab meetings, journal clubs, etc.
- Emphasize focus on data analysis, computational biology, making predictions, etc.
- How to best design a virtual program taking consideration of the students' needs, ability to focus online, etc.
- Using instructional designers to assist with online course delivery.
- <u>http://centerforneurotech.org/education-k-12-resources-teachers/neuroscience-neurotechnologies-e-book.</u> For creating interactive ebooks for asynchronous learning. Easy platform to use Pressbooks.

GROUP 3

Notes from Discussion

• Ann: reduce number of projects. Curtail projects. 100 % participation from 70 teachers. Community-based participatory science. Work with teachers and scientists in public health projects.

- Liz: Resources for how to ask a research question and how to follow through
- Ann: Spring projects shut down but restarted in the summer with virtual only projects
- Luke: HS 9-12. Wide net for outreach selection a couple dozen students to do research experiences.
 - Challenges: remote partners, uncertainty with COVID in HS and at University phases. No opportunities for HS students on campus
 - Response: at home lab kits for students to follow along at home. Guided lessons. Develop a project in space medicine. Near peer undergraduate students who mentor on the projects with open office hours on Zoom. Virtual lab tours. Involve more graduate students.
- Ellen: Whale Fest way to introduce more students to program (broaden scope). Zoom breakouts of 5-6 seemed to work best for connecting and belonging. Preferable to larger sessions, keep engaged. Focused projects into 'lanes' students receive research credit (Biology major credit adapted dual credit)
- Patrice: 2nd 5th graders in after school program observations. Challenges in terms of getting students to turn the computer back on. Little incentives for students to tune in and turn on.

Top Recommendations

- Ann: set up rubric of short-term goals. 1. Define question with approval. 2. Identify research resources with approval. Small steps they have to go through. Use research liaisons to work with teachers, researchers and students.
- Ellen: Zoom breakouts of 5-6 seemed to work best for connecting and belonging. Preferable to larger sessions, keep engaged.
- Limiting Zoom fatigue: kits, simulation and active learning.

GROUP 4

Notes from Discussion

Things that worked well (virtual)

- Science kits (staff hand delivered to local participants)
 - Had to re-collect the kits
 - Edgerton Center provided supplies students had two cameras, one on their face, one above them showing their experiment
- Partnering & collaboration with other programs within your institution
- Making it hands on
- Virtual mentoring engaging in a lit review under the guidance of a mentor
- Experimental design theory facilitated by post-doc and graduate students to help understand study method and design
- Networking
 - Informational interviews
- Weekly reflection meetings tried to connect with them on a personal level
 - Games, activities, other ways to connect socially
- Developing videos that are normally done during the program.
- Mixture of projects (in-person, hybrid, remote)
 - Students came to the lab in shifts
- Had zoom seminars featuring alumni from program. Very interactive.
- Mentors gave Zoom tours of their lab. Introduced their team, showed the instruments.
- A lot of time for reflection for the participants, filled with journaling/writing
 - How do you support the students through the extra writing/lit reviews?
- Never corrected their spelling/grammar, more focused on the flow of their ideas

Top Recommendations

• Daily debrief that are casual with the participants

Resources

• Sequoia Wright can share contact at Morehouse for curriculum

GROUP 5

What worked well

- Participated in Genes in Space proposal and were mentored by Baylor College students working with HS students
- Share via technology e.g. Padlet live, recording labs and scientists, engaging through polls, gopro,
- Delivered Bags of Science to the young people recruited. TAs walked through procedures. Participants on camera with scientist.

Challenges

- COVID came and schools closed suddenly, and programming did not happen this spring/summer
- Can't bring students to lab on campus; can't visit classrooms
- Challenging to know if participants got anything from the session
- Working with high school students difficult to follow progress
- Scientists are stressed getting back in their labs

Lessons

• Virtual mentoring can work with preparation and technology

Ideas we considered

- Think aloud sessions have researcher talk about what they are thinking and doing. Thinking WITH the scientist.
- Training scientists to share with students but we agreed that program participants are usually quite forgiving.
- How do you deal with helping students learn about developing procedures and plans for research?

GROUP 6

Notes from Discussion

What worked well

- Some institutions have brought students on campus
- Shooting videos on lab activities, potential for possible outreach to wider audience in future
- Kits, packages for students

Challenges

- Difficult to bring students to lab on campus
- Challenging to know if participants got anything from the session
- Working with high school students, difficult to follow progress virtually
- Scientists are stressed getting back in their labs
- Building relationships with schools and teachers
- Teachers are frustrated, are trying to survive
- Trying to coordinate filming, videos for lab safety
- Ways to overcome space issues, difficulty to get into schools
- Protection of Minors issues, state and federal labor laws etc.

Lessons

• Virtual mentoring can work

WHOLE-GROUP ZOOM CHAT

Larry Johnson: https://vetmed.tamu.edu/peer/videos/ Interviews with scientists, undergraduates, graduate students, veterinary students How to activities for hands on activities, scientist presentations Careers in STEM Real science reviews https://vetmed.tamu.edu/peer/cell-biology-real-science-review/ https://vetmed.tamu.edu/peer/cell-biology-real-science-review/

https://vetmed.tamu.edu/peer/infectious-diseases-real-science-review/

Liz Parker: Our program focuses on 6th-12th grade, so as we hope to increase research experience with our students, we are also competing with students who need to get afterschool and summer jobs to support their families. If anyone has good resources for paid opportunities or ways to pay high school students to work on research projects, please let me know

Julia McQuillan: Has anyone thought about summer programs for teachers that do not involve video remote time because they might be burned out from teaching in person and remotely?

Beatriz Perez-Sweeney: https://www.mindsetworks.com/science/

Ellen Chenoweth: Amy Jo can you give an example of a task you give students that sets them up for a low-stakes failure?

Atom Lesiak: De-centering the "genius" PI's who made discoveries in the educational process, could definitely help with making science more inclusive.

Emily Mathews: These slides are from a session I attended at NSTA in 2019 <u>https://tinyurl.com/NSTA2019</u> <u>https://tinyurl.com/NSTA2019Sheet</u>

Larry Johnson: Scientists young and old https://docs.google.com/document/d/1l9BL4jGBBp-KsWIdCeGiEsv1WJvRq5nDvS2t5-aHmBg/edit

WHOLE-GROUP REPORT OUT (lightly edited)

Luke Bradley: To provide the experiences here that are moving towards community-based projects, engaging teachers seems to work well. And then having hands-on activities at home that students can engage in while working remotely has been seeing some successes too. And then trying to bring in interactions with the universities to help guide, for example, how to structure research questions. So, it's much more being more active with that to make sure that they are able to follow through and address those challenges. Engaging the community through inviting a wider cohort through engagement

of online activities such as what Ellen mentioned about engaging students with the Whale Fest in the lower Alaska area to capture maybe a wider net.

Then, some of the challenges that we're up against, I think have been talked about throughout the conference, but certainly the inconsistency or the schools not maybe deciding on if they're going to be in person or not. The universities not letting students on campus for these authentic experiences, or teachers on campus to have that engagement. And so, breaking out the sessions into smaller groups seems to work well for connecting and belonging. They've noticed in our group that those were preferable to even larger sessions. So, there'll be more. Just more smaller sessions seem to be working and trying to limit Zoom fatigue as we're all experiencing as well.

Top recommendations we're setting up: rubrics and having defined goals with just small steps to go through so that you're making sure they're making progress throughout and really making those goals very clear instead of open-ended seems to have worked out well with a large program.

Ann Lambert: We started talking about challenges that were due to COVID-19 interruptions, like what do you do when students have an expensive device that they're supposed to be recording data on, but they are not physically present anymore in their classroom environment or in their research environment? And what do we do about students who don't have remote access? And we didn't really come up with great solutions to all of these problems, and generally said that one way to get around some of this is to use virtual simulations instead of actual scientific tools for these situations and that they were finding success at least qualitatively with these kinds of approaches. But we didn't really have anybody who had quantified whether or not these approaches were working as well or better than in-person approaches.

One of the top recommendations that we talked about for a while though, was related to the challenge of just keeping students interested, regardless of whether it's online or in person. In science in general, when they're faced with a "failure," because Adam had noticed that often students just turn off to whatever material they were learning, and maybe science in general, when they're faced with failure. A lot of the people in our group were saying there's a really good way to handle this and that is by talking about science as an iterative process, as opposed to a one-off trial where you either succeed or fail. And it's really resonated with a number of people in our group, especially when they were talking about research experiences that graduate students have, who have had to be perfect in order to get through their programs and have a really hard time dealing with failure if their first experiment fails. And that can also help with imposter syndrome that a lot of graduate students experience. So those are some of the highlights from group two.

Sarah Wojiski: I think in just focusing on some of our top recommendations, obviously, many of us were faced with taking programs and completely canceling them or taking them from in-person to online. And so, some of the best practices that we came up with that seemed to be working well for others in our groups were focusing on data analysis. So, if your students are involved in a research project, they're probably not going to be able to do some of the actual experimentation, but maybe more of a focus on data science, data analysis, computational biology, those types of areas, and asking mentors to assist with helping to design research projects that are more focused in those areas and other elements of the scientific method and scientific thinking.

One example that came up was instead of being able to have students do a sheep brain dissection, maybe they're watching a demonstration of that, but you're having an interactive discussion with them about predicting what specific structures within the brain might be responsible for specific activities and that sort of thing.

In terms of virtual research experiences, thinking from the student perspective, how to design a virtual program to avoid things like Zoom fatigue. So really being conscious and aware of how much time you're asking a student to spend on Zoom or online in a given day, or for an extended period of time. So, thinking about things like their ability to focus and needing breaks from that sort of thing. And then one thing that does tend to be missing in the online virtual environment is sort of that lab community building and getting that experience of what it's like to be a part of a research group or a research lab, so trying to find ways to facilitate students to be able to interact more with other members of the lab or other research staff within your institution. If they can attend lab meetings or sit in on journal clubs or something like that to help them get that experience.

And then one other thing we discussed is in the conversion of in-person to online, if you're building out an online course for your students to participate in, think about potentially incorporating or trying to get support from instructional designers or individuals that have real experience in designing online learning opportunities to help with the setup of the course and best practices of how it should be organized. And again, thinking about that user experience, since for many of us, this can be uncharted territory. So those are some of our group's highlights.

Sunita Chaudhary: We spent time talking about some of the issues that the other people have already touched upon. Some of the things we discussed were that it's very challenging to know if the participants are getting anything from virtual sessions that we are doing for them, especially high school students. They can be nodding their head, they can be there, but are they really getting anything out of those sessions? When you're doing live sessions, it's much easier to talk to them, to ask them questions. They're much more interactive than virtual sessions.

The other thing we talked about was that it's very hard because teachers are also very frustrated. They are trying to survive. So, trying to get through to them, to build relationships, and getting into the schools and trying to get the virtual curriculum to them, is also quite challenging. We discussed some issues with bringing minors onto campus, especially students who are under 16 years old. Each institution has protection of minor issues and how these issues play out in virtual settings. We discussed a little bit about that.

What has worked well is that some institutions have managed to successfully, which is great, bring students onto campus and are beginning to think about what in-person activities they can do with them starting January. Shooting videos of lab activities, which have a potential not just for virtual programming right now, but to reach out in future to a wider audience, as well as making kits and packages for students with well-laid out instructions that can be sent to students to work out at their homes.

Renee Bayer: We did talk about ways to work around things using programs that are already established that people could join, like Genes in Space, one group joined. Another was delivering materials. We talked about that, but I loved it because it was bags and science, and the staff went out and took materials to the students, including, I think it was also cameras. We used a lot of technology to help support mentoring and demonstrating, bringing the participants along at each phase.

Involving them in real time through writing things in Padlet or using Google Slides or Google Docs or whatever. So, a lot of use of technology, a lot of videotaping, GoPros. One of our lessons learned was that virtual mentoring can really happen if there's preparation, if there's involvement and a good use of technology.

Then we talked about maybe more think-alouds, [that is] having scientists talk through more of what they're doing, and engage participants in helping them think through what the next steps would be. The

point was about even fooling them into thinking that you don't know what to do. But you'd have to be really good at that, and we weren't sure about that, but that actually has happened to one of the researchers. He talked about being fooled by someone thinking that he had to actually help them so, that was really engaging.

And then, I think one big thing that a lot of people talked about, actually, we don't have to be that welltrained in some ways, thinking about our program participants, how they choose these programs and how forgiving they are, as we all learn how to get around these things. Are there other things that my group might want to mention, maybe a point or two?

Ellen Chenoweth: I guess I'll just add to something that I didn't think about in the breakout room that worked really well for us this spring, which is, we had planned to have our students present in person at the university as part of a research symposium, but instead, we had to do it on Zoom. But it actually worked out awesome because our students are rural and they're in different communities. And so, it allowed their parents to come, it allowed their principals and their teachers to come, and other students that we were hoping to recruit into the program next year. And so that's something that I hope that we'll continue to do especially because of our student population. So, we were able to have both community leaders and scientists from the university attend those talks and it went really well.

Louisa Stark: So that sounds like a case when using technology actually allowed broader participation than you would have had normally. Because yes, you do have a lot of space in Alaska between communities. So other thoughts that people had or questions that you want to ask the group? Yes, Atom?

Atom Lesiak: This question sparked a lot of conversation in our breakout group, and it was mentioned a bit by Anne. And for me, I've universally seen that if you give students an experiment and it fails miserably, or they feel like they did something that screwed it up, over and over again, it's disillusionment and turning off from doing those kinds of experiments. I know as an undergrad, the very first western blot that we did in my science lab, the TA forgot to put the correct antibody in the solution, and so the entire classroom failed the experiment.

I remember, and this sticks with me for such a long time that people looked around like, "I'm just taking this class to get through this class so I can go on to apply for med school or nursing or anything else. I do not want to do western blot because that just took two days to do this and we got no results and this is stupid and I'm not into it."

And so, when I see activities like hands-on activities, for me it's when it doesn't work, the dangers of that, when it's not framed correctly within what it actually means to be a scientist versus being an engineer. I'm really curious what people's approaches are around centering science as the failure process, rather than science as a thing that geniuses do and get right and then get Nobel prizes.

Marlys Witte: Make failure a positive phenomenon. In all of our programs, we started with medical students, with high school students. We have failure rounds in the middle of the summer, and everybody has to come in with a failure. Often, they'll say, "Oh, the same thing happened to me."

"What did you learn from it, and how did you change as a result of it?" And there are actually courses in engineering schools and elsewhere, they started decades ago, called Failure 101, where you'll analyze bridges that fall and so on and you look to what you learned from them. So, making failure something that you talk about, you're not ashamed of, and also analyzing it and sharing it. And often we have a lot

of laughter and people say, "Oh, the same thing happened to me," and so on. So, I think it should be made; I would recommend having failure rounds in the middle of every summer, where every student, either virtually or in writing or however you want to do it, shares a failure with the group.

Brandon Morgan: Usually, at the beginning of our summertime during our orientation week, we do an activity, that we are able to do virtually, where we ask students to kind of visually depict what a scientist is. In the past, it would be on a piece of flip chart, but this time we used a Google Slide. And they could use any representation, any person, and what are the ideas around science?

And so, it was kind of really trying to reframe what science is. It's not just for folks that get it right all the time. We often use it because a lot of our young people are from communities that are traditionally underrepresented in STEM, but we use it so that they can also visualize themselves as scientists, and also to break down those false paradigms of science that they might see like, "You get it right every time on the first try." And so, I think using an activity like that is also helpful. Scientists work hard. Scientists will fail, but failure is a big way to learn too. So, I think kind of reframing it in that aspect is helpful.

Jan Straley: Yeah. I had some technology issues. So, one good thing to what Brandon was saying is have the scientists bring a photograph of them at the age of the students they're working with. That way, the students can see the scientist as their age and their person. So, it brings a reality to the student linking to the scientist.

Louisa Stark: Oh, thank you for sharing that. I also just want to know if people don't have your chat open, Larry Johnson has shared several links about interviews with people at various stages of the science pipeline, and some activities and careers. And Liz has shared that the program focuses on sixth to 12th graders. So, they're competing with students who need to get after-school and summer jobs to support their families.

And does anyone have good resources for paid opportunities or ways to pay high school students to work on research projects? So, she's looking for ideas for finding funding to pay students on research projects. Other thoughts that people have about what's worked well or challenges or things that feel like insurmountable barriers given these needs to change our programs?

Amy Jo Clemens: I was going to add to the discussion a little bit about failure. And the idea of what we try to talk about with kids is persistence through failure. If you think about it in their K-12 world as they get older, things become real recipe-like in science classes, unfortunately, unless you're very fortunate, they also are very high stakes. They have one chance to do it or they have to come in after school to do it on their own, or they get an eight out of 12 and say, "Screw it. I don't care." All those types of things.

So how do you get them to have a different mindset that's that growth mindset? And so, trying to set them up with an activity that they don't really care that much about, that's kind of fun, that most of them will fail the first time and having it be that low-stakes failure and then have that conversation exactly.

I like how Marlys said, that she brings them in so that they can talk about it and they can share those feelings. Sometimes, we set them up on purpose at the very beginning to have a low-stakes failure so that we can say, "Now, what would happen if," I might steal your example, "this happened to you and you just spent two days all day long doing this. And then this is the failure that you went through." To get them to start to think about persisting through challenges is what we're getting at instead of labeling things necessarily as failures.

Atom Lesiak: Yeah. I mentioned this in the chat that it is like with graduate students that I've mentored. I always talk about like, "Well, we need to find a way to be able to publish or give you credit for those experiments that were genius experiments that just didn't work out the way that it needed to work out in order to get published." And I think, especially for students working up through high school, they get into undergraduate labs or undergraduate labs going into graduate school, getting credit for those experiments; finding a way to publish it regardless and almost kind of get that peer review of your failure.

I'm obsessed with that idea and I would love to find a way to have a depository of students that are learning, writing up their failures so that we can then take that as a publication that they have on their record to then kind of fill their resume in a way that shows like, "I'm thinking about science. I know how to learn from my mistakes. This is what I would have done differently."

That's what I want to see in my graduate students, because so many graduate students come in and they've never made a mistake. And then they screw up their first cloning experiment and they're devastated. And I think rewarding those little failures that lead up to it, I think, would transform the learning process in science.

Marlys H Witte: Yeah. It's really important that as part of the failure rounds, that the mentors are part of it and they share their failures. So that's very important. But also, historically, you can bring in all the failures that led to great discoveries and there are so many available. So that's another positive thing to bring in about failed and mis-done experiments that actually led to discoveries.

Louisa Stark: I do have a question for Amy Jo about an example of a task you give students that sets them up for a low-stakes failure.

Amy Jo Clemens: I can't remember it. It was something where it was... We had like 400 middle school students all at tables doing things. And I wasn't made aware of the fact (I was visiting for the day) that most of them were going to fail it and that my team had set that up on purpose. And so, as the team leader bringing it up to the front of the room, we'd attack them with their points and nobody was earning them, "Oh."

There's a whole lot of drama because they're middle schoolers of course. And then, yeah. And the team explained a little bit about what they were doing because as the tasks got more difficult, kids we're going to have to experience failure in kind of a competitive environment; they were earning points. And it's that social, emotional growth that they have to go through too.

Kelly Furr: It was when they were talking about natural disasters and they had to build the ship without getting it to sink. So, I think they gave them the pennies to make their boats sink. And so that's what it was. And then we came back, and we talked about why in that natural disaster and what happened. Like you said, 400 students, they loved it. They all learned so much from that little experience. Even me just observing it, I thought it was amazing.

Louisa Stark: ... And I want to recognize that Beatriz shared the www.mindsetworks.com website and Julia has asked, "Has anyone thought about summer programs for teachers that don't involve video or remote time because they might be burned out from teaching in-person or remotely."

Julia McQuillan: I just want to explain that I mostly do informal, but we are going to try to do a graduate class with teachers next summer to try to expose them to some of our informal activities and ideas and materials to see if they might want to try to bring them into their classes. And I'm a little worried that, at

least in Lincoln, Nebraska, most of the teachers are having to teach in person and remotely at the same time and they're really tired and burned out.

So, then I'm thinking if I'm going to have them in a two-week intensive remote class, that that might be really rough for next summer. So, I didn't know if anybody had any creative ideas for teacher professional development that in a pandemic world that might not be too awful. Like this great conference where you guys broke it up and you have lots of creative things, but I don't know if anybody's tried that yet.

Louisa Stark: Last summer, Julia, we ran a week-long co-design workshop with teachers from across the country. I could connect you with Molly Malone, our senior education specialist, who has been running a number of online sessions.

Larry Johnson: One of the things that we've done is to take a real scientific article and to pare it down to the middle-school level and then discuss kind of what was the big picture and some of the methods they used and what conclusions they drew from the data that they have. So, I put a couple of those on there. We have more, but I put a couple on there, real science reviews that were pared down to the middle school.

It took too, time to pare down because our science is pared down to the middle school to start with, but we used the word level, to be able to go down because it's kind of hard to get the word level down when you use scientific terms anyhow, but that was one of the things that we've done. And also, as you mentioned, we have interviews with scientists and we ask them various things like, "How'd you become interested in science?" And then like, "What kind of environment did you have coming up?" And things like that. So that was good. My son was on the science fair one time and they had six or seven Nobel prize winners at the top. And one of the kids asked him, "Why are you interested in science?" And every one of them had the same answer. It was a third-grade teacher that wouldn't accept mediocrity. It was a book that someone told them to read. Every one of them has some teacher or something that influenced them.

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Programs for Students: Discussion notes

Breakout Room Discussion Questions

- What kind(s) of programming worked well/didn't work well?
- What challenges did you face and how did you address them?
- Internet challenges
- Equity challenges (bandwidth in underserved areas)
- Kits for use at home; how did you distribute them?
- What length/frequency of online meetings seems to work best?
- What lessons did you learn that would be helpful to others?
- In your virtual setting, how did you assess "engagement", "science identity", "curiosity", and other measures that are associated with STEM persistence?

NOTES FROM EACH BREAKOUT GROUP

GROUP 1

What worked well?

- Online programming allowed reaching out to more students and serving new geographic areas
- Connecting curriculum to COVID-19
- Hands-on work at home with kits (e.g., plant survival)
 - Drive-through pick-up / pick-up kits with meals (asking parents to pick-up from the school anytime did not work well)
 - Should we create a SEPA repository of kits that were developed?
- Role playing, debates
- Students collect data online among themselves and from peers via psytoolkit.org
- Technological tools (e.g., Kahoot, Padlet, www.mentimeter.com/)
- Students working in small groups
- Question asking as a proxy for student engagement

Challenges

- IRB-related delays, especially from school districts
- Internet challenges (recording sessions is helpful)

Successful Strategies and Relevant Resources

- Frequency / duration: Max two hours a day with breaks, individual work followed by group check-ins
- https://www.bioedonline.org/
- Virtual office hours for students to ask questions

GROUP 2

Notes from Discussion

Challenges

- Moving from a completely hands-on engineering curriculum to a virtual program
- Assessing computer availability at home
- Differing computer availability at home from semester to semester and school to school

- Technology issues-connectivity
- Assessing how little students have available to them at home--even simple things like sugar, particularly with low-income students
- Grading policies
- Students may only have a phone-doing an essay on the phone is difficult
- Tribal access to internet was difficult, some had to go to parking lot
- Houston set up learning hubs for kids to use computers on site
- Some districts provided one device per household, resulting in many students at different levels who had to share devices
- Not able to do student work, even pilot testing, because of shut down of facilities
- How to use materials in virtual settings
- Various settings-hybrid, face to face, all virtual
- Engagement
- Problems with starting down the road of developing engaging "games/models" for online platforms

Successful Strategies and Relevant Resources

- Using images submitted by students to show their engineering projects
- Using materials readily available at home and using the least number of materials possible
- Observations of their own backyard-keeping a journal to engage students and assess what they have available at home
- Making activities friendly for home use--hard to determine what supplies they have at home
- Some schools purchased devices for all students who use Wifi, or cell data for all students
- Schools scrambling for funding for more devices-ran into delay in delivery
- Sending out kits to students--sent in various ways-mailed to students, distributed through meal pick up, distributed by supply pick up
- Houston prepares packets for student pick up.
- Doing online demonstrations
- Providing kits for students
- Gamification of topics for engagement--how to digitize tabletop games etc. since not every student has a game at home
- Using local graduate students or others to create digital learning activities/models/games
- Using professional organizations to create digital learning activities/models/games

GROUP 3

Notes from Discussion

Challenges

- Connection approaches:
 - Hybrid model- kids gather at community center w/ supervision, team Zooms with activities.
 Just got IRB approval to observe via Zoom
 - Community center provided photos of kids with masks on to help with identification
 - Also turned old programming into Facebook lessons (video, worksheet) Offered prizes for completing activity-submitted through posted picture. All done through parents as targeting a young demographic but saw a huge demographic shift from underserved groups to predominantly new, white, upper class kids.
 - Putting content (mostly video) online for communities to access
 - There are a ton of potential tools for sharing strategies, can be overwhelming to choose
 - Check in with your communities to choose what is familiar to them or easily accessible

- Recruitment:
 - Partner with a community center, use their audience (currently getting 15-20 kids participating despite 40 being enrolled, K-4)
 - Other groups have seen large drop off in participation
 - One team focused on community building in their program, have been offering more casual opportunities for high school students to interact--not content-focused, but providing spaces for participants to connect together on student-driven topics
- Accessibility challenges:
 - Secured additional funding to provide Chromebooks to students (get another device for students to work with).
 - Locally, Comcast made internet available, but wasn't high enough bandwidth for Google classroom
 - \circ $\;$ Other groups have also pulled in bridge funding for device distribution
- Assessment:
 - o Tools
 - Kahoot
 - Google classroom
 - Bring in focus groups led by evaluators with targeted question
 - Zigazoo for video sharing
 - Using Qualtrics for consenting (approved by IRB)
 - Others are using Docusign
 - What questions are we asking?

<u>GROUP 4</u>

Notes from Discussion

Challenges

- Depended a lot on where they were in their programming –
- Earlier was easier to make the pivots needed
- Programs in the middle of data collection were in much more difficult situation
- Many grad students were in jeopardy of not graduating, some people had to abandon data collection
- Family life dynamics were very impactful (i.e., can't meet because having to watch siblings)
- Older students had to work so if they were doing our program, they couldn't work -- we've actually paid them to do the project.
- One program had students needing residencies but residence halls were closed so they had to find them places to stay while they were in program

Successful Strategies and Relevant Resources

- Leaning more on video production instead of in-person
- Leaning on relationships that have been developed over years (teachers, directors)
- Throwing out the regular schedule and being as flexible as possible
- Allowing students an outlet to talk about other social/emotional needs in addition to the content of the project ("let's take a break and talk about how things are going for you")...build a "community" we might have come together about science, but now we can work together on "other issues"
- Having a variety of choices for students so they can choose the activities that work the best for their situation
- Using the mobile phone for program delivery instead of a computer

- Building in student payments when possible these students will often have more than one job in the summer, so we have to help them with that lack of employment due to participation in our program
- Individual needs are important interventions don't cover everyone, meet with your participants to see what they need and how you can provide support to address their particular barriers
- Converting to more of a gaming approach to try to increase engagement

GROUP 5

Notes from Discussion

Challenges

- Relevance of zoonotic diseases and curriculum development switches with COVID.
- Staff, students, leadership in and out of quarantine
- Addressing COVID
- Video development
- Forms?

Successful Strategies and Relevant Resources

- Use pilot projects to test out new seminar formats
- Co-develop COVID story with community members: <u>https://sites.google.com/view/envhealthcovid</u> <u>https://sites.google.com/view/learnenvironmentalhealth/lenses/covid-19</u> <u>https://weengage4health.life/coronavirus-covid19-learning-companion/</u>
- Developing just-in-time content without stepping into COVID trauma. Be particularly aware of higher impacts in specific communities. Check in with community contacts. Include COVID but apply learning to other diseases and systems.
- Buying Chromebooks for students with poor resources.
- Being understanding of reasons why students may not turn cameras on or speak up in class.
- Use Jamboard, Flinga, Slido, PollEverywhere for upvoting tools for allowing students to participate without their names attached
- Short videos, podcasts--less reading.
- Video creation support: <u>http://www.spencerauthor.com/how-i-create-sketch-animation-videos/</u>
- Small group leaders with nearer peers
- QR codes to bring up story and start learning.
- Flinga, Seesaw asynchronous apps? Docusign. Poll everywhere and Slido when you want them to see each other's work

GROUP 6

Notes from Discussion

Challenges

- Varying internet speed
- Students have other obligations at home, i.e., taking care of younger siblings
- Ensuring that loaned devices are returned safely
- Devices have limitations with apps that they can run
- Creating a community with students who haven't met each other
- Understanding if students are engaged in breakout rooms

Successful Strategies and Relevant Resources

- Interactive activities online videos
- Purchase laptops + hotspots for participants
- Virtual programming opens up and broadens participation
- Understanding available academic resources libraries, universities who loan devices
- Some districts have been able to provide devices to each student
- Finding connection to organizations that already have people picking up / dropping off (i.e., Food Bank deliveries)
- Pick-Up / drop-off dates -- one day during the week, one on the weekend where students / parents do a drive-by pick up and drop off
- 1-3 hours for synchronous activities
- Daily debriefs with students
- Implementing youth feedback to adjust the program (youth voices heard)
- Using breakout rooms for team building (ice breakers, games) especially at the beginning before starting work

GROUP 7

Notes from Discussion

Challenges

- Analog board games not something people want to do in a classroom--how can we make these experiences COVID-friendly?
- Digital divide is real.
- Disallowing stipends to student program participants (donor was found afterward)
- Technology issues
 - Bandwidth (crashing, so everyone has to turn off video)
 - internet access & bandwidth. Even when computers and service is provided to students, other challenges are presented (e.g. too many distractions at home with multiple kids).
 - These challenges are present even in areas with lots of access.
- Is content mobile-friendly? Need to create systems/infrastructure to reach multiple platforms and digital tech
- Everything takes longer. One example was 30 min. scheduled actually took 90 min.
- Loss of lab materials in classrooms (e.g. aquaponics)
- Anticipating virtual needs will be until summer for many

Successful Strategies and Relevant Resources

- Parallel Zoom curricula research team with mentor to adopt during COVID
- SEPA encouragement is to be creative and persistent
- Whiteboard technologies to work with students
 - o Miro,
 - o Mural,
 - o Jamboard,
 - o Blackboard & Blackboard Collaborate,
 - o Moodle
- Working with school administrators to get internet access for program students, hardware and internet access/bandwith
- Getting curriculum integrated into school classes
- Adapting programs to family audiences
- Adapting to make content directly and personally relevant to audience in addition to providing

access--giving back and building trust -- especially with culturally specific communities such as Indigenous people

- Limiting Zoom groups to 4-5 students helps encourage active participation
- Distributing kits to public libraries: families sign up for program and, pick up kit at library, with no need to return, during designated time window
- Distributing kits to schools teachers get them to the students and present the content
- Developed Quizbowl events in Alaska buzzers can adjust to bandwidth

GROUP 8

Notes from Discussion

Challenges

- Renting and mailing laptops to students did not work out due to tech equity issues
- Poor internet connections
- Kits logistical challenges (getting address, relying on parents, expenses, time consuming, etc.)
- Transportation issues parents aren't able to take students to in-person programming
- Have to consistently remind students to fill out pre-/post- online surveys

Successful Strategies and Relevant Resources

- Interpreters for students with hearing impairments
- Live and pre-recorded sessions
- Utilizing college students as peer mentors (three middle schoolers to one college student)
 - Have older students train younger college students
 - Students do review games, not actual instruction.
- Using Miro and other whiteboard programs/spaces to simulate board games
- Have parents involved (introductory meeting to engage parents)
 - Have volunteers help parents fill out surveys (some parents had difficulty with reading, language)
- Through students journaling, one group was able to get a science of their development of a "STEM identity"
- Even though students may not have had their cameras on, they were still engaged in the chat
- Translating paper surveys to online surveys

GROUP 9

Notes from Discussion

Challenges

- How do you prepare for such an unexpected event?
 - Putting together the place for resources
- Remote challenges Zoom and postal mail. Finding there are so many ways for things to go wrong.
- Transfer of in-person materials to online is difficult, not a quick fix
- Mentorship while over-Zoomed
- Do we have ways to navigate and rubric to determine best practices around how to proceed?
 Can we assume the worst and hope for the best?
- Mailing materials to participants, centering accessibility for all learners
- Complex tasks can be hindered without an in-person facilitator
- Lots of regulations and guidelines prevent SEPA specific innovation
- Response rates are low with students; data collection has been lagging.

Successful Strategies and Relevant Resources

- Collaborations have helped with creating supply chains and Zoom accessibility with other organizations
- Using asynchronous activities and interactions. Some interactions are in chats
- Creating online quizzes, "choose your own adventure"
- Piloting is important, as is borrowing from previous successes to help guide
- Remember that there is flexibility, pivoting to new directions, and rededicating resources is acceptable under SEPA Guidance
- Remote hands-on can benefit from simplicity
- Maybe have "office hours" for a facilitator to receive and integrate feedback
- Slow-down and focus on making what you already have better "Mile deep, inch wide"
- Chat functions can enhance engagement

RESOURCES PLACED INTO CHAT IN ZOOM

Larry Johnson: https://vetmed.tamu.edu/peer/videos/

Interviews with scientists, undergraduates, graduate students, veterinary students How-to activities for hands-on activities, scientist presentations; Careers in STEM; Real science reviews

https://vetmed.tamu.edu/peer/cell-biology-real-science-review/ https://vetmed.tamu.edu/peer/clinical-trials-real-science-review/ https://vetmed.tamu.edu/peer/infectious-diseases-real-science-review/

Liz Parker: Our program focuses on 6th-12th grade, so as we hope to increase research experience with our students, we are also competing with students who need to get afterschool and summer jobs to support their families. If anyone has good resources for paid opportunities or ways to pay high school students to work on research projects, please let me know

Julia McQuillan: Has anyone thought about summer programs for teachers that do not involve video remote time, because they might be burned out from teaching in-person and remotely?

Beatriz Perez-Sweeney: https://www.mindsetworks.com/science/

Ellen Chenoweth: Can you give an example of a task you give students that sets them up for a low-stakes failure?

Atom Lesiak: De-centering the "genius" PI's who made discoveries in the educational process, could definitely help with making science more inclusive.

Emily Mathews: These slides are from a session I attended at NSTA in 2019 <u>https://tinyurl.com/NSTA2019</u> <u>https://tinyurl.com/NSTA2019Sheet</u> We have a lot of students (middle school) with COVID questions, any resources

We have a lot of students (middle school) with COVID questions, any resources people would point us towards?

Larry Johnson: Scientists young and old
https://docs.google.com/document/d/1l9BL4jGBBp-KsWIdCeGiEsv1WJvRq5nDvS2t5-aHmBg/edit

Ellen Chenoweth: https://sites.google.com/view/envhealthcovid

Steve Ortiz: We use 'Adobe Sign" and I have been very happy to use it to get students and others to sign, when we need documents from them. You can also save templates and do mass sending when you need to send the document to a large group.

Lisa Marriott: <u>https://sites.google.com/view/learnenvironmentalhealth/lenses/covid-19</u> WE Engage for health: <u>https://weengage4health.life/coronavirus-covid19-learning-companion/</u> (from my environmental health class; the first link is how to create a collaborative website for a class project (COVID & environmental health is the focus), but if you need rubrics or structures, that is all laid out.

Lollie Garay: Baylor College of Medicine COVID HACKS. COVID curriculum also available online at: https://www.bioedonline.org . More activities to be added soon!

WHOLE-GROUP REPORT OUT (lightly edited)

Ellen Chenoweth: So, some of the challenges that we had, that we discussed, were switching curriculum to acknowledge COVID and trying to figure out what the best way to walk that line between acknowledging it and incorporating it as like a relevant, just important thing that's on students' radar right now and using that to pivot to broader topics or other types of zoonotic diseases without lingering on that, especially now as more and more students are having personal experiences with that. We talked about some tools for video development and also tools for getting students to contribute in an anonymous way during class to increase engagement if they're worried about typing in the chat, under their names. There's also some online tools on our slide that allow students to contribute and then also to upvote each other's responses and that Lisa had some success with in terms of improving engagement.

Along with the COVID question, we had a group that had developed COVID stories with community members that are available on videos. And so that was a nice collaboration with the specific communities. And they really suggested checking in with their community context to make sure that the content was appropriate based on what the situation on the ground was. We talked about the need to buy Chromebooks for students who have poor resources for connectivity. And then I got some great advice for how to streamline forms for students and parents when there's a ton of forums. And so, there are a couple resources on our group slide for that, including something called Seesaw, which I'm excited to look into and DocuSign to try to get those permissions done remotely and without creating a huge barrier and inequities problems for students as well.

Tony Beck: And I think Nancy Marino is also putting together a collection of resources created throughout the many, many SciEd projects at the SciEd website. So, you can contact her there. And the new metadata analysis will allow the students or teachers or us to dig down and really get specific stuff, rather than a lot of false negatives or at least data we don't need, links we don't need.

Ido Davidesco: I can share on behalf of Group One. We talked about, clearly there are many challenges with the transition to online, but we talked about some opportunities, mainly reaching out to more

students, extending the capacity of some of our steeper programs still being new geographic areas now that, we don't all necessarily need to be in the same place. We spent some time talking about kits. So, we had the few members who sent out science kits to students to facilitate hands-on work at home. It sounds like one thing that worked well is to set it up at school drive-up where parents come to pick up the kids. Another idea would be to pair that with meals, pickups that seems to work well. We also talked about all these very helpful kits that were developed by ADEL SEPA project. And perhaps an idea would be to create a repository of all these kits so they can be accessed more easily.

Other ideas that came up are students collecting data online, which actually came up for my own SEPA where we used a website called Site Toolkit, where students can participate in different cognitive tests and collect data from themselves and peers or even family members. In terms of challenges, we discussed some IRB related delays, especially from school districts. We also talked about internet challenges and how important it is to record sessions and make them available after they're in. And perhaps one other idea that I'll share is that in terms of assessing student engagement, one idea that came up was to look at question asking. And students' participation using question asking in virtual classrooms and even set up virtual office hours for students to ask questions.

Speaker: Throwing out the regular schedule and being as flexible as possible, allowing students an outlet to talk about their social emotional needs, in addition to the content of the project and how that was really a great stress reducer when there was a certain amount of time that the kids could talk with their mentor or project person about the things that they were dealing with at home and trying to do the project and other life situations, family, life dynamics. Someone talks about having a variety of choices for the students, so they could choose activities that work best for their particular situation. Other folks talked about being able to work with the school districts, maybe to find where there are hot WiFi spots for free.

And I'm actually considering doing the whole project on the smartphone instead, since that seems to be a technology that more families had access to in the summer. A couple of projects surprisingly said they always build in student payments when you can, especially if you're trying to reach out to kids who we know are going to have at least one job, if not two, during the summer. It's just unrealistic to expect them to give up that income and come work in our project. So, from the beginning, figuring out how can we build in some type of payment to the students with time sheets and accountability so that we are being realistic about their family dynamic. Oh, someone said that they're converting to more of a gaming approach to try to increase engagement instead of just do this activity, earning points toward some particular endgame and competition.

And overall, we just really talked about how the individual needs are so important as well as interventions that you put into place, but there's not one intervention that's going to help solve the situation for every kid in the program, so you're going to have to take many times to reach out to them individually, to find out what is their particular barrier. And is there a way that you can get around their particular barrier to participating in the program? We wish that we could do X, Y, or Z and maybe pre COVID, it would solve 85% of the things that families and kids are dealing with, but that's just not true now. And how do you build those relationships? So, they'll tell you that, so you can try to help address that and get them in the program and learning.

Lisa Aslan: Scheduling programming, at least in the summer, we were trying to be mindful of when students were going to pick up meals for their families, because the public schools or the libraries had meal pickup times. And so, making sure not to schedule programming during that time. A lot of us doing this work over the summer found that three hours was the limit for any synchronous activity and within that not doing the same thing for three hours, but maybe one-hour chunks of time.

We also found that just for youth who hadn't met us before or staff or each other, a lot of us spent significant amount of time in that first week, doing a lot of team building, getting folks comfortable, using the breakout rooms as much as we could, so that youth could really get comfortable with each other and begin to build that community, especially as an antidote to their social isolation, which a lot of them were feeling. I'm trying to see if there's anything else that wasn't said.

We were having a discussion about how do you measure youth engagement and what do you do about videos on, videos off? So in the summer we were quite strict and would put youth in the waiting room if their cameras were off and they hadn't notified us, but this school year, we're trying to take a little bit more of a youth development approach by just measuring participation any way they want, because we know a lot of youth by the end of the day are Zoomed out, the same way a lot of us might be. And so, we want to trust our young people to put their cameras on. There might be some portions where we say, "Okay, you need to have your camera on." And there might be other times in the programming where we say, "Okay, it's optional, but we really want to hear from you either via the chat or you can unmute, even if you have your camera off." So, we're trying to measure engagement in multiple different ways, not just by people having their cameras on.

Cecilia Nguyen: Just a few things that haven't been already mentioned as far as like technologies and stuff we talked about a little bit. We threw out a bunch of different whiteboard technologies and collaboration tools that were useful, including Mural, Jamboard, Moodle, and one program used Blackboard Collaborate well. So, there was that. On equity, there was some conversation about responding to community specific needs and asking them, "okay, now how do we adapt things to something that's relevant to you?" And also designing the program to give back, in that way giving back to the community, also building trust. And that works very well, especially with culturally specific communities, such as indigenous communities.

As far as distribution goes, there was some leveraging of schools, getting teachers to distribute kits, in some cases having the teachers present the content themselves, but working with school administrators to do that as well as possibly get access and hardware to students, as far as technology and being able to do that. Of course, there are still challenges with bandwidth and home distractions and things like that too. And then there was a little bit a conversation about how we need to adapt to all the different digital technologies and platforms that are available because you can create a really great website that supposedly is accessible to everybody, but is it going to be mobile friendly? Is it going to be something that uses a lot of processing power? That sort of thing.

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