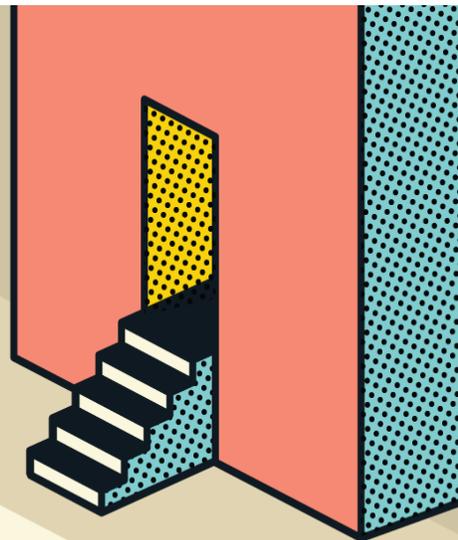


Exploring the Nature of Science Through Smithsonian Sidedoor Podcasts

Phase 2 Evaluation: Interviews with Teachers

October 2020



SMITHSONIAN
ORGANIZATION
AND AUDIENCE
RESEARCH

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Introduction

Background

In 2019, with support from a Gates Foundation Youth Access Grant, the Smithsonian Science Education Center (SSEC) launched *Exploring the Nature of Science Through Smithsonian Sidedoor Podcasts*, in partnership with the Smithsonian Office of Communications and External Affairs (OCEA), the Smithsonian Center for Learning and Digital Access (SCLDA), and the National Zoological Park/Smithsonian Biology Institute (NZP/SCBI). Centered on a curriculum designed to teach about the nature of science and knowledge creation, in the summer of 2019, SSEC conducted a teacher workshop in which participants were introduced to podcasts as a teaching tool, and provided training, support, and tools to implement the *Exploring the Nature of Science* curriculum.

In support of this project, Smithsonian Organization and Audience Research (SOAR) developed and has since implemented a two-phase evaluation study.

In Phase 1, SOAR conducted pre- and post-training surveys¹ with workshop participants to understand whether the workshop:

- Increased teachers' knowledge, experience, and comfort with teaching the nature of science, knowledge creation, and communication of science research using podcasts.
- Added to teachers' skills for teaching the nature of science, knowledge creation, and communication of science research.
- Increased teachers' understanding of the effectiveness of podcasts as a learning tool, as well as how to develop podcasts and teach students to do likewise.
- Increased teachers' awareness of Smithsonian education resources.

In summer of 2020, SOAR conducted Phase 2 of the evaluation. The study was originally designed as interviews with participating teachers after the implementation of the curriculum in their classes. Phase 2 would explore teachers' experiences implementing the curriculum: successes, failures, obstacles, comfort with technology, interest in podcasts, and if they would change anything about the training. However, as COVID-19 forced teachers into remote and distance learning, SSEC made the decision to broaden the scope of Phase 2. In addition to following up with teachers who had completed the workshop, SOAR interviewed a broader group of teachers to understand more generally how they were adjusting to remote teaching and what digital resources (content, platforms, webinars, trainings) SSEC could provide to support them.

¹ See report: "Exploring the Nature of Science Through Smithsonian Sidedoor Podcasts" Phase 1 Evaluation, Smithsonian Organization and Audience Research, July 2019.

Participants

SOAR interviewed 15 teachers. All interviews were one-on-one except for one, which included two teachers. Teachers taught a wide variety of subjects, though mainly science, technology, engineering, and mathematics (STEM), in both high schools and middle schools. Of the 15 participants, three had participated in the training and one had implemented the curriculum (see Appendix for the teacher participant summary).

Methodology

Interviews were conducted from July through September 2020. Interviewees were recruited by SSEC. All interviews were conducted virtually, either by Zoom or by phone, and lasted between 45 minutes and an hour. The audio was transcribed, and the transcripts were analyzed by SOAR.

SOAR Study Team

Interviews were conducted by Whitney Watriss, Director, Claire Eckert, Social Science Analyst, Julia Gross, Social Science Analyst, and Hal Olson, intern. Julia Gross and Hal Olson analyzed the transcripts. Julia Gross wrote the report.

Key Takeaways

Teachers Turn to Trusted Sources, Vetted by Other Educators. Teachers tended to rely on resource recommendations from colleagues and online teacher groups or forums. For some, it was especially helpful to see how other educators had used resources, how they adapted them, and what suggestions they had for other teachers.

Teachers Want Adaptable, Pre-Packaged Lesson Plans. Teachers spoke about the importance of having easily accessible lesson plans and activities that they could use on a moment's notice. For some teachers, it was crucial that these resources be easy to modify and adapt.

Students Need a Break from Screens. Teachers said they don't want their students to sit in front of the screen all day. They wanted interactive, hands-on, non-computer activities that would engage and stimulate their students.

Teachers Want Labs That Can Be Done Safely During A Global Pandemic. Labs were a big concern for teachers during remote learning and moving into hybrid learning. Teachers expressed frustration about not being able to provide their students with hands-on learning and the lack of virtual labs or safe at-home labs.

Resources Must Work on All Types of Devices. For some teachers, it was crucial that resources be accessible on all types of devices, including phones and tablets, and not just laptops. This was significant for teachers in non-one-to-one laptop/tablet schools or in communities with inconsistent internet and bandwidth capacities.

Teachers Want to Increase Their Digital Literacy. Teachers wanted more trainings or workshops on different technology platforms: basic instructions as well as more advanced guidance on how to be creative and make the most of the platforms and resources.

Teachers Value Collaboration. Teachers emphasized the significance of collaborating and communicating with fellow educators. They wanted groups and forums that enable them to work with colleagues, both in their immediate school and across the country.

Section 1: Findings from Interviews with SSEC Workshop Participants

SOAR spoke to three workshop participants. Of the three, one had implemented the curriculum. The analysis below reflects the experience of the three participants but cannot be used to generalize the overall success or goal achievement of the workshop or curriculum.

Reflections on the Workshop:

Teachers reflected positively on the workshop and described it as relevant and useful.

I think that it was a great training. It was one of the better trainings in my 20-some years [that] I've been to. It was useful, and it was helpful, and it was interesting. ... I think the presenters did a great job. It was relevant. Many times you go to trainings and it's like, "okay, I have seen this, I've done this, I've heard this a million times." And then when I take it back, it's not something I can actually use. But we both found it to be relevant to teaching in general, regardless of our curriculum. [Participant 12]

For one participant, the workshop increased their interest in and awareness of podcasts as a teaching tool.

I just think [podcasts are] another way to interact with the kids and let them be more of the creators. Giving them a little bit more ownership of their learning. Podcasts are cool. [Participant 12]

Curriculum:

The two teachers who attended the workshop but did not implement the curriculum explained that they had planned on using the curriculum but were forced to postpone because of COVID.

We had talked about [using the curriculum] and we had started thinking about different ways to do a cross-curricular kind of activity for the kids...I talked with my tech person about it, and she was all down for doing it. And she was really excited about it. And then COVID hit the fan. [Participant 12]

The teacher who did implement the curriculum spoke positively about the curriculum. In particular, they found the field research and experimentation components provided unique opportunities for their students.

They don't get too many classes where there's an opportunity to interview people. They don't get too many classes where they're doing community surveys. They don't get any classes where they're making podcasts. This was the first time that probably 98 percent of them had ever been exposed to most of these pieces. [Participant 1]

They indicated that technology posed a challenge to their students who relied on Chromebooks and found that many of the platforms did not work on their devices. As a result, the students using Chromebooks felt overwhelmed, completing all portions of the curriculum except for the actual creation of the podcasts.

The technology aspect was the hardest. We have Chromebooks, and the Chromebook platforms for making podcasts—maybe they've improved because this was almost a year ago now—I think [the technology] overwhelmed a lot of them. [Participant 1]

That being said, the teacher explained that they would use the curriculum again.

I'm going to do the best I can. And if we are able to go back to school in the spring, this [the curriculum] was definitely be something I can pull out because we'll be back in the field together, and I'll try it again. I [in] no way have given up on it. [Participant 1]

Section 2: Findings from Interviews with Non-SSEC Workshop Participants

In broadening the scope of the project, SSEC and SOAR aimed to understand what digital resources teachers relied on in remote teaching, what they look for in resources, how they find resources, and what resources they felt were missing.

Used Digital Resources:

When asked what digital resources or tools they used in remote teaching, teachers spoke about a wide range of learning management systems (LMS), digital platforms, and content sources (see Appendix for lists). Teachers spoke about learning to adapt and modify existing resources for their grade levels to meet the needs of their students.

Every time I take something [a resource], I'll edit it, or I will have a secondary doc that will kind of guide them through what I want them to do with things. It seems like, very rarely do I just kind of spoon feed like, "go to this [resource]."
[Participant 15]

Additionally, some teachers constructed their own resources by compiling videos, articles, and activities into guided slides or documents.

It's just a guided document. It's sort of like step one, step two. It would be the "explain" section or would be the "elaborate" section. And so I'd have videos or resources that they would click on and look at, so they didn't have to jump around from website to website. Everything was streamlined in one document.
[Participant 9]

Podcasts

Teachers were specifically asked about their use of and interest in podcasts. Some indicated that they had listened to teacher training or professional development podcasts. Others incorporated podcasts in their curriculum as a way to draw students into lessons. A few had their students make their own podcasts.

I've had students make their own [podcasts], and they have even made their own fake advertisements within those. Students, they really like [making podcasts] because it's different than your traditional project. But they don't have to show their faces [to] make a video, just their voices, and they're more willing to have that sort of played in front of their peers than the video. [Participant 11]

Other teachers who had not used podcasts indicated an interest in incorporating podcasts in the future, but they felt that they lacked skills to do so or were unsure how to fit it into their curriculum.

I personally haven't [used podcasts]. I mean, that is one area that I've not really done before and I was least comfortable with. I wanted to go with my strengths for the spring, since it was such a crisis teaching moment. [Participant 5]

I helped lead an after-school club, and we were actually going to enter NPR's challenge.² We were actually brainstorming ideas and everything and then that kind of fell to the wayside. So I've always wanted to [use podcasts], that was, I didn't know how to incorporate it into my science classroom due to time constraints and alignment with the curriculum. [Participant 9]

Other teachers indicated they had not used podcasts in their classrooms because they perceived the length of a podcasts to be too long and they felt they would lose their students' interest and attention.

I have not. I've heard of some, but they're usually really long, and I think that I would lose my kids. [Participant 2]

Finding Resources

It's Overwhelming

When asked where and how they find resources, teachers spoke about being overwhelmed by the sheer number of digital resources and options.

I imagine for a lot of teachers it [finding resources] can be overwhelming, particularly if they're just getting a bunch of emails of like, "this is going to solve all of your remote teaching problems," and "check out this webinar," and "go to this thing." And it's like oh, like it's so much. [Participant 10]

Some spoke about saving a huge number of resources and ending up never using them because there were too many or because it took too much time to go through each resource.

I got a of list of things [resources]. ... I got thousands of different things that are interesting and cool and that I forget about. [Participant 15]

How They Find Them

Teachers spoke about relying on recommendations from their peers when looking for resources.

So that's important for me, also just the reputation of the source. You know, do my colleagues around the world agree that it's a valid and reliable source of information? [Participant 11]

For some, social media postings or groups were crucial in finding resources. Other teachers spoke about more formal community groups or teacher forums such as "Project Lead the Way," "Teachers

² An annual competition where students between 5th and 12th grade submit a podcast through their class or extracurricular group. <https://www.npr.org/2018/11/15/650500116/npr-student-podcast-challenge-home>

Pay Teachers,” “National Science Teachers Association,” and “American Chemical Society.” Teachers described these groups as a way to find resources but also to see how other teachers and educators have used and adapted the resources.

There is a cohort of us online who post a lot of materials on our blogs. And I'm always happy to take from people who are doing work similar to me. So yeah, I get a lot from other educators. [Participant 7]

I want to know what other teachers have done. I like to see comments. ... Sometimes on “Teachers Pay Teachers” when you go and look up something, people comment and they’ll be like, “I use this instead of that.” I want to know what's the overarching idea or the guiding question for the lesson. What do we want our students to learn or take away from this specific lesson? And then I want to see materials and everything [is] pretty much laid out the way it should go. [Participant 6]

For other teachers, subscription programs or workshops were preferred ways to discover resources.

The primary sources came from the modeling curriculum [workshop] and then drawing in things that we use from the past and incorporating new materials into that for this past year and for this coming year. [Participant 14]

Others were provided lists of approved resources from their schools or school districts. This was [a] helpful way to narrow down an otherwise overwhelming number of resources.

Not having an overwhelming list of options to choose from has been helpful too: so [the school] paring it down to, “Hey, these are three ways that students can do videos because they address our privacy concerns [and] are developmentally appropriate.” [Participant 5]

And others spoke about searching for resources through search engines like Google.

I Google it and I just go through all the things until I find something. Sometimes I never find exactly what I feel would be a great way to teach something. [Participant 1]

What Are Teachers Looking For:

Interactive Content to Engage Their Students

In conversations with SOAR, teachers spoke about the immense challenges of remote teaching, specifically wanting to prevent students from simply sitting in front of a screen all day watching lectures or completing worksheets. Teachers spoke about wanting activities and materials to actively engage and stimulate their students.

I'm desperately looking for more engaging ways [of teaching]. I don't want [my students] to just watch the video and answer questions, or do an interactive and answer questions. I'd love to do more project-based learning. I'm just not sure how to really do that, in the virtual sense, and connect it to the curriculum. [Participant 9]

Activities or learning opportunities that you can have to actually go out and do something or even those observation prompts of like, "go outside and look for this." Helping teachers develop experiments or things that students can do instead of just, "Okay, sit here and watch this video. Fill in the worksheet." [Participant 4]

I want to give [the students] a lab where they're going to have to develop a relationship where at the end they go, "Oh, the slope of this line is always the force over the mass. That's really interesting. I wonder why that is." And then we can build that discussion up. That's really my sole criterion. Does it help provide structure for student thought? And if so, then it's a tool that I could probably use in some way. If it's more passive and just the student is receiving information, that's not something I'm terribly interested in. [Participant 7]

When asked what would be engaging to their students, some teachers spoke about the importance of visually appealing design layouts. Others spoke about sites and content that are easy for students to navigate and use.

Is it intuitive? Are the kids going to be able to figure this out with minimal direction, or are there so many components that it's going to overwhelm my students with special needs? [Participant 5]

[The resource] would have to be easy. Sometimes I show them a digital tool and they really struggle with being able to use it, so it has to be accessible to them. It has to be intuitive, not thousands of buttons, something very simple that I could teach them how to use. [Participant 3]

Lesson Plans and Activities That Are Ready to Go

One frustration that teachers faced in remote teaching was the amount of time it took to develop lesson plans and find supplementary digital resources.

I don't want [the lessons] to be the same for every unit. I need some variety and ... I think that's what's hard for teachers. Because we can't investigate all of [these resources]. It takes hours to investigate it all, and once school actually starts, we're not going to have time for that. [Participant 8]

Teachers spoke about wanting accessible lesson plans, activities, and interactives that they could implement right away in their classes.

Teachers need [materials that are] right there and right now and that [are] practical. This is what I can do now. Here's an example of a lesson that I can implement tomorrow if need be, and here are the resources I can go to get other things. [Participant 5]

For some teachers, it was important that lesson plans be marked by age and level so that they could easily find appropriate content for their students.

We would also like to have some age-appropriate readings that are scientific but not so scientific that it pushes them over the edge. [Participant 12]

Other teachers spoke about the importance of being able to modify materials to tailor them to their students and curriculum.

I like an already planned out lesson plan for me. Whether or not I'm going to follow it exactly, I like to see what is suggested to teach. And then if there's something I need to modify, I'm really great at just saying, "You know what? I don't think that's good for my level of students." [Participant 6]

Any sort of resource or material that can be easily added on to, whether it's with more in-depth readings or more in-depth video content or if it's some sort of online simulator or activity, something that can be scaled up or scaled down. [Participant 14]

Free Resources:

Free or discounted resources were additionally crucial for teachers.

I really appreciated when different platforms and tools offer a free subscription for teachers. There are some resources I would like to use, but you have to pay more. The school has just bought 20,000 masks, so I'm trying not to ask for any money for things. But [it would be helpful to] encourage resources to provide that service for free or for discounted rate. [Participant 11]

Just resources that are free and easy to access. I think free is the big thing because teachers are so underpaid, and I feel like you have to buy a lot of things. Districts are so strapped for cash, and you don't want to ask them for too much. But at the same time, we're educating our students. [The students] should be able to get what they need. [Participant 6]

Resources with Present Day Connections:

Teachers were also looking for content that students could relate to through connections to current issues such as climate change and the pandemic.

[Students may ask,] “Why do I [have] to wear this mask?” Well, now we're going to study in science why you wear a mask and what is the science behind it. And I think that is a huge empowerment for them. And they could go and tell their friends; they can go and tell their parents and their family members. They actually learned something that was useful instead of mitosis, that they're all like, “What would I need to know this for?” [Participant 8]

Resources That Meet the Students Where They Are:

Some teachers spoke about the need for resources that meet the needs of individual students. For some teachers, this meant resources that are short and/or allow students to move at their own pace.

I think it's giving [the students] tutorials and tools and things that go at their own pace. Learning those platforms [at their own speed] has been what I found to be most effective. [Participant 10]

Students [need to] self-schedule when they were doing the work. [...] Some of my students were helping younger siblings with their remote learning, so I tried to keep videos to about 10 minutes or less. Ideally somewhere [between] five to seven minutes, or even shorter, just because I didn't know how much time they'd have to actually sit down, watch, digest, and then do the follow-up work for the video. [Participant 4]

For others, especially teachers at non-one-to-one schools (schools where students are not provided their own laptops or tablets), resources needed to work across any type of device and in homes with low internet and bandwidth capacity.

Some of [my students] only had their phones [with which to complete school assignments]. So if [the resource] was something that would not work with just a phone, then it's something that I might recommend but not necessarily assign as part of weekly work. A couple [students], because we're pretty rural, have really, really slow connections, so sometimes [assignments with] huge videos just weren't an option. [Participant 4]

Some of [the students'] homes only have one computer and multiple people needing it. So if you're doing a livestream, you can't expect students [to be available to participate in a livestream]. Any Zoom meeting was completely optional the whole time we were off. [Participant 11]

Special needs teachers emphasized the need for resources to meet accessibility standards, including working with screen readers and other device accessibility features.

I'm shocked about the lack of [digital resources with] built in readers, screen readers, a native screen reader function, magnifier, being able to change the

background, the color, the text, because some of those our students find distracting. Sometimes they lack the ability to manipulate the mouse depending on their disability. ... In one of my classes I had a girl who was deaf and a girl who was blind, two different girls. They were in the same class. I'm like, "Oyee." So they need two different things. [Participant 3]

Other teachers were looking for resources appropriate for English as a second language (ESL) students.

I look for resources that are already broken down, not too wordy, if you will. So [resources that are] easy for me to translate it into another language. [Participant 9]

Resources That Can Work Online or In-Person:

Teachers spoke about the challenges of teaching a class made up of in-person and remote students. Teachers spoke specifically about wanting remote students to feel included in in-person activities and discussions, as well as foster community between all students, not just those in-person. These teachers wanted resources that could engage and work for both in-person and remote students.

I think being able to use something in the classroom that can easily be adapted to a kid's home. ... I think [resources are needed] for sure with science, [in particular] hands-on activities, because these kids that are at home aren't going to be able to be in the classroom and they're not going to want to watch other kids doing the lab. [Participant 2]

Following State Standards or School Philosophy

Additionally, for some teachers it was important to find resources that fit with their state standards, curriculum, or with their school's education philosophy.

I like [resources that are] tied to the standards too because in our lesson plans we always have to say which standards we're looking at and making sure that they're Common Core or whatever state because I don't even know, some states don't use Common Core. So we do in Illinois, but we also have our own set of standards, too. So I like to see that tie in as well. [Participant 6]

First of all, [we] definitely need more digital resources. Things that would interface well, that would upload quickly. That would be definitely tied to our [standards of learning] SOLs. [Participant 12]

I'm looking for things that align with my personal educational philosophy, which is that students learn science best by doing science. That's why I don't lecture. Everything that we do in my classroom comes from an experiment. If we can't describe what we're talking about, we'll build an experiment to do so. I'm always

trying to find things that probe at student understanding and what students are thinking. How are they interpreting this? How are they observing and analyzing this? [Participant 7]

For one teacher, having resources tied to state standards was especially important as their school transitioned toward new standards.

As we go forward and go to next generation standards, [there will be people who] will struggle with [the transition]. So if you're looking for something to help out with, [create resources for the new standards that show] what's the inquiry look like and why [and] how do you connect the phenomenon to what you're trying to learn. ... Those [resources to help with the standards transition] would be helpful. [Participant 15]

Nature of Science

A few teachers additionally were looking for more resources to help teach the nature of science.

In a lot of science class[es], we don't address the nature of science very well. Science is an active process. And we are always learning things. And we are always having to change what we think we know based on new evidence. That's definitely an area where [the Smithsonian] could easily do something, like observing the behavior of wildlife around you and then ask, "How do you think [what you're observing] will respond to something? Go out and do that. Observe how they respond. Were you correct? Were you not? How could you follow up with that"? ... It would get them thinking about how things work, making hypotheses and predictions, gathering evidence, organizing data, analyzing data, having to communicate that, maybe to their peers, and then going back and adjusting what they think based on their data. [Participant 4]

Addressing Race and Social Justice:

For other teachers, it was important to find materials and resources that help them to address race and social justice.

[Teachers and school staff have] all been coming back to school for meetings [where we have talked about] dealing with racial inequalities and things like that. And it's something that, as a science teacher and as a white person in the field trying to negotiate and navigate teaching science theory and fact[s] in a way that is racially sensitive, I'm trying to find the right way to describe this. So much of science—[historically] so many of the major discoveries in science— have come from predominantly white men because they were the only ones that were afforded the time and the ability to go to school and study these fields. How do we authentically incorporate minority voices in there as well? [Participant 14]

I would like training on how to revamp curriculum to incorporate [Black Lives Matter]. I'm always trying to teach about social justice, but being more intentional about that. I'm working with [a colleague] on revising one curriculum, but I would like it to be more widespread. There are so many ways to make connections, but it's quite overwhelming. [Participant 11]

Specific Missing Resources:

Virtual and at-Home Labs:

When asked if they were missing specific resources, teachers immediately pointed to labs. Teachers spoke about the lack of virtual labs or lab-like activities they could have their students do at home or in the classroom.

The majority of what we do is hands on. We do a whole entire unit [using microscopes]. We [learn about] photosynthesis. ... At the end of the year, we do a biosciences unit where they do an electrophoresis lab [and] a microbes lab. They do bacterial transformation. These aren't things I can do online. [Participant 9]

[We need] online labs or citizen science or ways [for students to] access content in a lab at home. For science teachers in particular, the strongest argument I'm hearing for the push to go back to in person is [that we can't] do labs well enough virtually or at home. And I think that having the resources [and] developmentally appropriate content [for] virtual or do-at-home safe labs is a critical component that teachers need right now. [Participant 5]

Teachers also expressed concern about how to do labs when back in the classroom. Some were unsure how to conduct labs while having students safely social distanced. For others, the concern revolved around how to include remote students in labs that were happening in the classroom.

Labs are a big concern. We, as a department, and I particularly, really think science education should be as hands-on as possible. I've really worked in the last couple years to implement hands-on activities for the students. So, making sure that they still have that experience this year, and getting to manipulate the lab equipment, and to experience firsthand all of the things that I would hope they would take away from this year. [In] some cases, I do have the equipment and the space to provide everybody with their own materials to do each lab, but in the last couple years labs are usually done with a partner, sometimes two or three partners. So figuring out how to do labs, and how to make them work, and how to make them work safely, and making sure that there's hands-on as possible. [Participant 14]

Online Simulations:

Other teachers emphasized the need for online simulations.

It was really hard to find a lot of online simulations for physics... For life science, there's just not much. So I felt it was kind of repetitive in that sense. There's a lot of videos, quizzes, things [of] that nature. [Participant 9]

Kids are sitting at home not being able to be [at school to] manipulate stuff. It'd be good to have [resources] pre-prepared. It would be interesting to have some kind of evolution simulation that could play out over time [with] some variations. [Participant 15]

Digital Textbooks:

Other teachers spoke about the need for easily accessible digital textbooks.

More selection of books. We struggle with really high-quality audio books, digital books, especially now. Because I'm thinking how I am going to get these copies of *Catcher in the Rye* to these kids. [Participant 3]

Trainings and Teacher Resources:

Tech Trainings:

Teachers spoke about the stress of transition to new platforms and learning management systems, along with the need for webinars and trainings to help them get up to speed. Teachers wanted trainings on basic tech use as well as more nuanced ways they could take advantage of technology.

Trainings are awesome. Any kind of training that helps us to use the technology. I think there's almost too much out there. I don't want to say everybody needs to use the same thing, because that's not realistic, and it shouldn't be a one size fits all. [Participant 6]

[Trainings are necessary for all teachers, but] especially the teachers that are like, "How do I get better audio with my calls and my video? How do I make my videos more interesting? How do I make a video and edit it without really expensive editing software?" Or just doing a screen cast where I have to get it right the first time. Right now I am even creating an online course for teachers that are just getting started with making video lessons. [Participant 10]

Teaching Science:

Some teachers spoke about the need for trainings on how to teach science, especially for elementary teachers.

Elementary teachers are kind of overloaded already with the math and the English and all that stuff. And so if Smithsonian is looking for something there, that be [possible] and probably useful. ... I know I've gone in and talk[ed] to my

own kids [and] teachers a few times about how to use the science end.
[Participant 15]

Resources to Help with Collaboration:

When speaking about the challenges of remote learning, teachers spoke about feeling disconnected both from their students and from their colleagues.

I [would] love to be in there with my kids. I feel like nothing replaces getting down on my knees in front of them, at their desk[s], and looking them in the face. The connection I make with them in person I feel cannot be replaced. That's what I spend the majority of my time doing: building connections with them because they don't learn from teachers they don't like. [Participant 3]

One of the things that I'm really concerned about this year, because we are going to be completely distance from the jump, is that I don't have those months to build that classroom rapport of what the [classroom] expectation is. My class runs fairly differently from most classes these students have been in in the past. That is something that I am thinking deeply about this summer, trying to understand how I build that sort of relationship as well as [the] classroom expectation [that] this is a discussion-based class. If nobody talks, we don't learn anything. [Participant 7]

Teachers spoke about wanting resources to connect with their students but also to help facilitate collaboration with their colleagues. For some, this meant their immediate colleagues, but for others it was creating connections with teachers all over the country.

I think one thing that would be helpful with any course [workshop, or training] is providing that community forum for educators to give feedback. But also just kind of to connect with each other. I feel like sometimes it's hard to find a one-stop shop for resources and ... [a] forum for science teachers or, even, it might be nice to have a forum for students to connect across environments. I think we're all, it feels like we're all looking for ways to create community as well in our classrooms. So resources that help us or required some sort of collaboration, even though it's digital collaboration right now, would be really nice to help students connect with one another and not feel so isolated. [Participant 4]

Database of Resources:

Others spoke about the need for a database of resources to help them find and filter through the overwhelming number of digital resources.

Going back to that organization piece ... one has [to have] time to look through everything. If there was a centralized location where you could go and be

connected with a good chunk of it [the available resources], [that] would be helpful. [Participant 15]

SSEC/Smithsonian Specific

Work with and Advertise to Teachers:

Teachers recommended SSEC work with teachers, as well as resource designers, to develop curriculum and digital resources.

[When creating a resource development team], you could find people that know the technical aspect of it [designing resources] but may not know contextually how to make that [those resources] work for teachers or you have the teachers that can do the teaching aspect of it but may not know the technical aspect of the remote side. [Participant 10]

Others advised to advertise specifically to teachers.

Within the next couple weeks, [I would recommend] having a big PR push “Hey, this is what's available for teachers. Look at all the wonderful lessons that are already available for you. Look at this forum that's available for you to do troubleshooting [for] your classes and get the support for the pedagogy, or the content, or the labs, or whatever. Hey, it's Smithsonian, so you know you can trust it. We're not a company trying to get you into our forum and then sell you a subscription to something or our app or whatever.” Right. [Emphasize] the fact that it is a trusted source, the fact that it's free. [Participant 5]

Hearing from Scientists/Behind the Scenes at the Museum:

Teachers were additionally interested in behind the scenes tours of museum collections and hearing from expert scientists.

It would be really neat to have [a tour] from the Smithsonian where it's already prerecorded and you have maybe a scientist that's behind the scenes, just talking about particular topics like natural selection, or geologic time, or mass extinctions. We cover that too, all that fun stuff, so that would be super fun. Or to even talk to a scientist would be amazing, too. [Participant 9]

I know there's all this stuff behind the scenes too, especially the fossils—that would be cool to see—or the different minerals, the museum with the ruby slippers. [It] would be cool to see all the different things that are also there, you know how, [how] they tie it into the society at that point [in] time would be cool. You guys have a lot of different things. You have all the different museums. There are connections between all of them? How is the Native American Museum connected with the African American Museum and the Museum of Natural

History? What connections are there among all those? That'd be cool.
[Participant 15]

Appendix A. List of Interviewees

Interviewee ID #	Subject	Grade Level	Whether or not they attended the training, and if yes, if they implemented the curriculum
1	Science	High School	Yes, curriculum implemented
2	Science	Middle School	No
3	Special Education	High School	No
4	Science	High School	No
5	Science	High School	No
6	Special Education/ ELA	High/Middle School	No
7	Science	High School	No
8	Science	High School	No
9	Science	Middle School	No
10	STEM	Middle School	No
11	History/Government	High School	No
12	Science	Middle School	Yes, curriculum not implement
13	Special Education, Language Arts	Middle School	Yes, curriculum not implement
14	Science, Math	Middle School	No
15	Science	High/Middle School	No

Appendix B. List of Digital Resources Mentioned by Interviewees

Learning Management Systems (LMS):

- Blackboard
- Google Classroom
- Schoology
- Canvas
- Remind

Smithsonian Resources:

- Smithsonian Learning Lab
- Motion and Design
- Explore Build
- Zoo Webcam
- Online simulators
- Front Royal Wildlife camera

Platforms:

- Quizlet
- Edpuzzle
- Doodle Notes
- Google Science Fair
- Near Pod
- Flip Grid
- Gimkit
- Escape Edu
- Gizmos

Content Sources:

- Interactive Constitution website
- History Chanel
- Bill of Rights Institute
- I-Civics
- Crash Course
- BBC One
- Stanford History Education Group
- No Red Ink
- Screencastify
- Explorelearning.com
- CKtwelve.org
- Santa Coloring
- Amoeba Sisters

Labs:

- Phet
- Edvotek
- Pivot