Theory-based Science Communication at Comic Cons

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Abstract

The majority of research done on science communication happens in spaces where people already have a vested interest in or knowledge of science, such as museums and science cafes. Thus, there is a gap in understanding what theory-based science communication looks like in non-science-centered spaces. This qualitative research study, which featured cosplaying science communicators at comic conventions, offers insights into what science communication practices occur within everyday spaces. We conducted observations of and semi-structured interviews with 15 cosplaying scientists, examining how they utilized effective framing and narrative structuring when communicating science at comic cons in cosplay. Across 700 coded utterances, cosplaying scientists most often used effectively framed messaging which allowed for comic con visitors to unite their interests with STEM topics. Alternatively, we rarely witnessed cosplaying scientists using messaging that assuaged or addressed politically-polarized scientific topics, such as climate change. Our research provides evidence how science communication changes when it occurs in everyday spaces and indicates avenues for future study in these spaces.

Keywords: Museum outreach, science communication, pop-up museum, effective framing

Word Count: 6380

Introduction

Our contemporary society is deeply dependent on applications of science in daily life. Scientific inquiry and findings affect everything from the clothing we wear, commutes we take, and how we engage with work or hobbies. People are often exposed to scientific concepts in artificial or incoherent ways, leading to persistent disconnects between scientific concepts and their everyday applications, meanings, and importance (Fischoff, 2013). Even when communicators sought to make science more accessible through professional development, audiences perceived such communicators as ineffective (Rubega et al., 2021). To create links between scientific concepts and the general public in ways that the audience perceives as effective, we need practical solutions that draw on audiences' interests (Dahlstrom, 2014). A novel way of creating such links is using cosplay to merge interest-based activities with science education and communication in informal educational settings. Cosplay, a blended word combining costume and play, is the process of dressing up like a character from popular culture and attending events, such as comic book conventions (i.e. comic cons) (Gittinger, 2018; Yamato, 2020). Cosplay is becoming increasingly widespread with many ages, ethnicities, race, gender, education, and occupational backgrounds represented in the cosplaying community (Rosenberg & Letamendi, 2018), including educators seeking to engage audiences on a range of scientific topics (Stoneburg et al., 2020).

The nuances of the cosplaying experience as it relates to science identity creation and informal STEM experiences can be used to glean important insights into broader issues of access and equity. In particular, marginalized groups along racial, gender, and socioeconomic identities face additional barriers to both informal and formal science education in the dominant Western culture (Avraamidou, 2020). By leveraging popular culture through cosplay, science educators may facilitate experiences that are engaging, as well as accessible, just, equitable, and inclusive, leading to the development of greater science capital and encouraging lifelong learning for a diverse audience. Currently, there is a dearth of research connecting cosplay to STEM education as well as a lack of established best practices in place for educators interested in using cosplay as a form of outreach and education. Next, we describe topics that highlight the importance of considering the intersection of informal STEM education and cosplay.

Informal STEM Experiences and Science Communication

Science communication is a field that "inform(s) people about the benefits, risks, and other costs of their decisions, thereby allowing them to make sound choices" (Fischoff, 2013, p. 14033). It has also been defined as "the exchange of information and viewpoints about science to achieve a goal or objective" (National Academies of Science, p. 2). In many cases, "communication" and "science education" research are unnecessarily separated from one another in terms of research and practice. From a sociocultural learning perspective, communicating about science in this way can be categorized as science learning (National Academies Press, 2018). Thus, we see no reason to silo "science communication" and "science education" research and seek to share insights gained from our study of educative science communication in a novel informal STEM learning environment. The practices science communicators use are rarely studied; instead a larger focus is given to backgrounds, expertise, and personal experiences of communicating science (e.g. Jarreau et al., 2019; Calice et al., 2022). Such personal experiences and background cannot be divorced from the practices that science communicators utilize, and yet, the two remain divided. Additionally, while the tradition of doing science communication spans at least 50 years, theoretical foundations for science communication research are nascent (Gerber et al., 2020). The two fields of informal STEM education and science communication have overlapping goals of encouraging and developing critical thinkers who learn about topics and can transfer their learning to new situations. Studies like the one described here have potential to develop both theoretical and practical insights for novel informal STEM learning and science communication.

Previous science communication research has focused on more “traditional” informal STEM learning environments such as aquaria, museums, and science cafes (Childers et al., 2021; Hetland, 2019; Katz-Kimchi & Atkinson, 2014). These informal STEM learning environments are often inaccessible to wider audiences as they cater to people with a pre-existing interest in STEM learning (Archer & DeWitt, 2016) or to those from privileged backgrounds (DeWitt & Archer, 2017). This inaccessibility and inequity can be addressed through interacting with wider audiences in novel informal STEM learning spaces (Falk et al., 2018). We focus on novel informal STEM learning environments, sometimes characterized as “everyday spaces” (Stofer et al., 2019), in which visitors are not necessarily focused on gaining STEM content knowledge. Such spaces include bars, laundromats, and comic cons. While Stofer and colleagues (2019) explored informal learning environments of laundromats and bars, we focus on comic cons, which are yearly events held in multiple cities and where thousands of visitors share their interests in movies, comics, video games, or popular culture. For this study, scientists who participated in the act of cosplaying communicated science at comic cons. Following a description of our conceptual framework, we will further describe the context and participants within our study.

Conceptual Framework

We integrated two conceptual frameworks, effective framing (Druckman & Lupia, 2017) and narrative structuring (Dahlstrom, 2014), to describe aspects of educative science communication efforts that occur at comic cons featuring cosplaying scientists. Effective framing emphasizes specific components of information that can be used to help people construct opinions (Druckman & Lupia, 2017). It has been used to analyze portrayals of climate change within science textbooks (Román & Busch, 2015; Busch, 2021, 2017, 2016) as well as in scientific fields like environmental conservation (Jacobson et al., 2018). Tenets of effective framing include competition for attention, political polarization, and politically-induced status quo bias. Narrative structuring of science communication “describes the cause-and-effect relationships between events that take place over a particular time period that impact particular characters” (Dahlstrom, 2014, p. 13614). The narrative structuring conceptual framework includes three main elements: causality, temporality, and character. Narrative structuring has been used by scientists and public health communications to change opinions on vaccines (Brodie et al., 2001), environmental beliefs (Dahlstrom, 2010), and HIV/AIDS (Vaughan et al., 2000). With this two-pronged conceptual framework in mind, our research sought to answer the question, *In what ways do cosplaying scientists’ science communication practices at comic cons align with or deviate from theoretically-established science communication practices?*

Materials and Methods

Recruitment and Context

We partnered with Initiative [name blinded for review], an educational initiative dedicated to making science accessible through cosplay by designing and hosting pop-up museums, creating pop culture-inspired lesson plans, and building relationships at varied events, including comic cons. At comic cons, artists, merchants, and scientists have booths where visitors can interact. Such booths, when transformed into pop-up museums and staffed by scientists who are dressed in cosplay that aligns with the science content featured in the pop-up museum, have the potential to become spaces that offer opportunities for informal STEM learning. Scientists affiliated with the Initiative were interested in sharing science with diverse communities to foster science appreciation through the use of nerd and pop culture. Under [University IRB protocol #XXXX blinded for review], we recruited participants by emailing scientists who our contact at the initiative knew were going to attend and communicate science at pop-up museum booths at comic cons. Thus, for this research, we focus on delineating the science communication practices of cosplaying scientists at comic cons.

Scientists consented to participate after filling out a survey (supplementary material) that asked their scientific expertise and demographic information including age range, gender, sexual orientation, ethnic heritage; demographic questions were included as we were curious of the composition of cosplaying scientists, since a great majority of traditional science communication takes place in spaces which often feel unwelcoming for people from diverse backgrounds (DeWitt & Archer, 2017). Scientists were compensated for their participation with a $75 Visa gift card. We studied 15 cosplaying scientists (Table 1) who communicated about science at pop-up museum booths at four comic cons within the western United States.

Pop-up museum booths were themed to reflect fantasy or science fiction worlds, such as Dungeons and Dragons, *Game of Thrones*, *Star Wars*, and Pokemon. For example, in the pop-up museum booth called The Galactic Archive, museum specimens such as crinoid fossils, dire wolf and american lion skulls, and geological specimens represented the flora, fauna, and planets of the Star Wars universe. Scientists were then dressed in cosplay as characters from the Star Wars universe such as jedi, X-Wing pilots, and Princess Leia.

[TABLE 1 ABOUT HERE]

Data Collection

Data were collected in two phases: observations at comic cons and post-comic con semi-structured interviews. We observed cosplaying scientists at pop-up museum booths at four comic cons in the western United States. At the booth, multiple scientists dressed in cosplay were present to talk with comic con visitors about the pop-up museum's artifacts and stories. Scientists were randomly selected for observation through giving each a number (e.g. Ashoka = 1, Sabine = 2, etc.), rolling a die, and observing the scientist that corresponded with the number rolled. To prevent observation bias, scientists were not told if/when they were being observed. Using a data observation sheet that included definitions of elements of narrative structuring, effective framing, and other, observers wrote detailed notes during the observation period (Supplemental material). Each scientist was observed for 30-minutes multiple times during the comic con, as scientists would take 30-minute shifts at the pop-up museum booth. When possible, two observers would observe the same scientist as a form of data checking (Spradley, 1980).

In the second phase, we conducted one-on-one, ZOOM-based, semi-structured interviews no more than three weeks after each comic con (Supplemental materials). These interviews lasted approximately 45 minutes and contained questions that asked scientists to reflect on their experiences at the comic cons, expanded on researchers' observations at the comic cons, and related to elements of narrative structuring and effective framing, such as, "Think about or imagine a time at a comic con when you've used a story to explain a scientific concept. Please share." Interviews were transcribed in otter.ai and then listened to by a research team member to make corrections; this also served as a first pass at data analysis as the researchers made initial notes about the interviews. Transcripts were uploaded into MAXQDA for coding; the coding scheme was based on elements of effective framing (Druckman & Lupia, 2017) and narrative structuring (Dahlstrom, 2014), with the category of other used to capture aspects that were meaningful but did not fall into the original conceptual framework. Coded segments ranged from a sentence to a paragraph. Each researcher individually read each interview transcript, coded it, and then the research team met to discuss codes to consensus (Richards & Hemphill, 2018).

Results

The 15 participants we observed and interviewed had varied scientific backgrounds: seven paleontologists, two astronomers, and one scientist each from biomedical engineering, chemistry, herpetology, earth science, plant science, and psychology were represented in our data. Scientists self-identified as men (n = 6), women (n = 6), agender (n = 1), non-binary (n = 1), and genderqueer (n = 1). Most self-identified as white, often mixed with another ethnic background, such as Asian. Eight of the 15 scientists indicated a sexual orientation other than straight—bisexual (n = 3), queer(n = 2), fluid, pansexual, or asexual (n = 1 for each) while the other seven scientists indicated their sexual orientation was straight. Additionally, most indicated that they were between the ages of 25-34 (n = 12), while three others said they were between 18-24. The varied gender identities, sexual orientations, and scientific expertises were important when these scientists represented themselves and their science to public audiences. As we see in some of their interviews, their gender identity and ethnic backgrounds became an especially important part of the ways in which they communicated science while in cosplay.

Across all interviews and observations, we coded 701 segments (Table 2). We most often saw the code of competition for attention (n = 113), followed by effective framing (n = 102), and causality (n = 96). Competition for attention was most commonly observed in observations (n = 45) whereas effective framing was the most observed code in the interviews (n = 71). The least common code we saw in the study was politically induced status quo bias (n = 11). We now contextualize our findings by sharing quotes from participants.

[TABLE 2 ABOUT HERE]

Effective Framing and Narrative Structuring: How Scientists Encouraged People to Interact with Science

During our interviews and while observing scientists, they most often employed effective framing (n = 112) and its subcodes of competition for attention (n = 113) and least often used political polarization (n = 20) and politically-induced status quo bias (n = 11). Effective framing and its subcodes allowed for scientists to provide specific information to help others understand, frame, or correlate their pop culture-based interests with science.

Participants highlighted their usage and strategies for effective framing and how that applied to their work at comic cons. Drake, a paleontologist, highlighted this is the way that he talked about the design and choices of objects he used for the pop-up museum booth. He explained that within Star Wars, there were fruits on the planet Tatoonie called black melons, which stored water. When we observed him at a comic con, we saw Drake explaining to audiences,

> So this black melon instead stores water inside of its hard exterior shell. And that's how they adapted and evolved. To [explain that in the Star Wars universe] the creators of Star Wars and The Book of Boba Fett, they looked at sea urchins. And sea urchins are super weird. They've got this weird exoskeleton. And so they took that and turned it into a fruit--the black melon in Star Wars. (Drake, observation)

In our interview with Drake, we asked him to explain how he was thinking of communicating the black melon/sea urchin connection to comic con visitors. He said that he liked being able to tell the "story of how something on Earth got adapted into something completely unrelated in the Star Wars galaxy…It was fun getting to explain the chain of events that led to a sea urchin painted black" in the pop-up museum booth" (Drake, pos. 62). In a similar vein, Hera, a paleontologist said, "a phrase that I find myself, and that I saw other people using a lot on the booth is like the real animals we have here are way weirder than anything in the Star Wars universe…So, it's like [a] truth is stranger than fiction kind of a concept" (Hera, Pos. 34). For Drake and Hera, who connected their knowledge of paleontology and biology to the booth's *Star Wars* material, a way to build interest in an interaction is to communicate about just how "strange" many beings and processes are in the natural world.

Ashoka, a herpetologist, built on the idea of "truth is stranger than fiction" in showing aspects of her science that many visitors likely never had the chance of interacting with. Ashoka would show visitors a preserved lizard tail that she collected during a research trip to generate questions, saying that a booth visitor might say, "'Yeah, I've seen a tail before' [so] I'll be like, 'okay, but have you seen a preserved one? Like, have you seen one close up? Like, do you know…what it is that makes it so they can drop their tail?'" (Ashoka, Pos. 44). These instances of scientists sharing science with comic con visitors in a way that generates interest are examples of theory-based science communication in the everyday space of comic cons.

Additionally, cosplaying scientists often supplied pieces of information that helped comic con visitors in discovering or learning about science, which was defined as *competition for attention*. Ashoka's interactions that revolved around her lizard tail are examples of this. While she first effectively framed science for visitors by showing them the lizard tail, she then continued to help visitors engage with scientific information about the lizard tail by comparing vertebrae to something many visitors have familiarity with: the plastic building blocks known as Legos. When we were observing, we saw Ashoka prompt a visitor, "you know what Legos are, right? The lizard tail…like the vertebrae connecting to each other--they're like Lego bricks!" (Ashoka observation). In this interaction, Ashoka helped the visitors learn about the lizard tail vertebrae by focusing their attention using an illustrative example from a material they likely already had experience with. The visitors had their attention on the tail specimen, and she connected that to scientific concepts and practices from their everyday life. Ben also made sure that visitors could learn about science when he explained that touchable objects enticed visitors. In our observations of him, Ben would say “hey, would you guys want to go ahead and touch a real fossil?” (Ben observation) in reference to a T. rex tooth or a jaw of a fossilized ray. When asked in an interview to explain why he would do this he said, “So we can draw more people in, and present whatever it is and be like ‘we have some extra stuff over here in the booth, would you guys want to come in and have a look at it as well?’” (Ben, pos. 78). In the comic con context, other booths and people can distract visitors’ attention, so Ben introduced visitors to objects they could both see and touch as a way to initiate and further conversations about science. Sabine explained the reasons for trying to connect with visitors using objects or their interests by saying that the pop-up museum booth was “catered to Star Wars fans, and that was an establishment of common ground” (Sabine, Pos. 20). When cosplaying scientists sought to meet people where they were in regards to interest and science content, they were showing empirical evidence of the theory-based science communication practice of competition for attention.

Narrative structure, defined as *the cause-and-effect relationships between events that take place over a particular time period that impact particular characters* (Dahlstrom, 2014), allowed scientists to tell stories about science that interested both themselves and those with whom they were sharing science. In both observations and interviews, we coded instances of narrative structuring (n = 42) and its subcodes causality (n = 96), temporality (n = 57), and character (n = 26). We also developed three subcodes for character, which was originally defined as “including actors (humans or otherwise) that act within a narrative” to account for nuanced descriptions that were not accounted for in the original code. Those subcodes were character in a story (n = 42), reflection on interaction (n = 29), and character in cosplay (n = 25).

Scientists often indicated the ways that got into science or how they shared science with others, which fell into the code of *narrative structure*. When describing herself to one of the interviewers, Maz said she was a graduate student who worked on exoplanets, but when she interacted with people at comic cons, she emphasized different pieces of herself, including “the fact that I am interested in science fiction and thinking about overlaps between what's science fiction and what can be real and then talking a little bit about the fact that I work on science of life on exoplanets.” (Maz, Pos. 8). Similarly, Bantha, a paleontologist, described their story of getting into science, saying they were

> never into science as a kid. I was never into science in high school, I was never into science. Even in college. I started college as a business administration double major, and only took a science class because you need to take one to graduate. So I thought, okay, geology has gotta be the easiest one, you're looking at rocks, how hard can it be? And then joke's on me, because you use physics, chemistry, biology, everything in geology. But that's where I learned that,

> like, you can get paid to go hiking, and you can get paid to dig up dinosaur bones and my entire perspective on what science is completely changed. (Bantha, Pos. 10)

For Bantha, they described a dislike of science during childhood through the beginning of college which shifted when their understanding of the practices of science expanded to include things of personal interest. Bantha's experience growing up and never liking science and Maz's overlapping identities as an exoplanet researcher and a science fiction lover are examples of past experiences shaping the ways that they saw the world as cosplaying scientists and thus ways to share science with others.

Narratives shared by scientists and pop-up museum booth visitors link people, places, and things together. In our research, this is defined as causality and is a sub-code of narrative structure. Bantha, when talking about how they communicated with visitors illustrates causality when they said, "...I start there [with peoples' interests], because that really informs how I communicate science and how I talk about science. Because I love when I hear people say that they always were interested in science and Jurassic Park inspired them…" (Bantha, Pos 10). With this quote Bantha explains why they feel the need to start with interest, as it is a way to link to the science components. In another example, Sabine described how she would talk about the dynamics of planetary systems in Star Wars and their relation to real-world planets:

> [S]ome of the faculty that I work with discovered Tatooine-like planets that actually orbit binary stars. So, if [booth visitors] were like looking at the Tatooine stuff, I'd be like, oh, …this is a really dry planet. And like, why? How do you think the two suns from Tatooine affected this? …Like taking an element that I know about the story about Star Wars and being like, did you know that like, these kinds of planets actually exist in the real world? (Sabine, Pos 102)

Sabine discussed characters such as the faculty she worked with, the booth visitors, and the plants like Tatooine, as well as the causal relationship between suns and the planet. With such examples, we saw that scientists were often well-versed in connecting the narrative structure of science and of their lived experiences in the world.

Not Getting Political About Science

Two theoretically-based aspects of effective framing, politically-induced status quo bias and political polarization*,* were less frequently seen in our observations and interviews. In regards to *political polarization*, which is defined as *framing information so people pay more attention to the informational content of science-based messages so they can reconcile their politized beliefs with scientific consensus* (Druckman & Lupia, 2017), we saw very little evidence in our observations of scientists attending to or being confronted with this (n = 20, 3.39%). As Luke and Ezra indicated, they were not attempting to "change minds" (Luke, Pos. 36; Ezra, Pos. 94.) in regards to scientific information. The rare instances of political polarization that occurred in observations were with Ben, when he would preempt conversations surrounding fossilized specimens on display, specifically of dinosaurs saying, “yes, [dinosaurs] had feathers, no we don’t know what is going on with spinosaurus.” (Ben, observation). Ben’s indication that paleontologists at the booth did not know about spinosaurus stem from the fact that it is a popular, charismatic megafauna featured in the *Jurassic Park* movies and that it was a dinosaur whose few fossilized remains cause debate in the field about its locomotion and aquatic (or not) lifestyle.

We also saw a lack of codes related to *politically-induced status quo bias,* which was defined as *framing science as consensus-based to overcome narratives that are created by politicians to uphold existing state of affairs.* We only saw this code appear 11 times in interviews and observations, which accounted for 1.5% of the total codes. Keo lamented in their interview, “It's hard to convince people who are set on something that doesn't have a scientific backing” (Keo, Pos. 92). Leia, a chemist, explained that she rarely felt the impetus to overcome political narratives about science, as she tended “to stick to areas of chemistry that the general population don't always think about…it doesn't often come up because I'm not studying climate change. I'm not making drugs. I'm not testing vaccines. I'm not studying evolution like those controversial subjects.” (Leia, Pos. 38).Thus, although both politically-induced status quo bias and political polarization were key aspects of the theory of effectively framed science communication as theorized in the literature, within the everyday setting of comic cons, scientists rarely explored, explained, or communicated science in these ways.

Through our interpretations of the scientists' experiences, we analyzed the how and why of the scientists’ communication practices. Our research goes beyond descriptions of what the scientists are doing to share scientists’ reflections on how practices are chosen, as well as their perceptions of the benefits or challenges when having discussions with diverse audiences.

Discussion

Cosplaying scientists were adept at employing theoretically-based science communication strategies when communicating science at comic cons. Scientists effectively framed “real world” science by situating what was known about the universe and relating it back to audiences’ interest in fictional stories—such as Sabine connecting astronomers’ work on binary star systems with the Star Wars planet of Tatoonie. Previous work on effective framing (e.g. Dahlstrom, 2014) has focused on traditional informal STEM learning spaces, with this work we show that scientists employ theoretically-based science communication in the everyday space of comic cons. Additionally, previous work has explored science communication and learning in spaces where audiences already have an interest in science learning, such as science cafes (Childers et al., 2021) and thus, scientists’ communication does not have to bridge gaps between everyday interests and science interests. In characterizing science communication within the everyday space of comic cons, we show evidence that the theoretically-based science communication strategies of effective framing and narrative structuring can be effective in everyday science learning spaces (Stofer et al., 2019).

As noted in the findings, we saw little evidence of the theoretically-based science communication practices of political polarization and politically-inducted status quo bias. While these aspects are well-covered in traditional informal STEM learning environments, e.g. exhibits on climate change (Thompson, 2022), framing messaging about healthcare (Lundgren et al., 2019; Stofer et al., 2019), and training future science communicators (Heslop et al., 2021); they were not as apparent when communicating science in an everyday space like a comic con. The fact that some scientists avoided or claimed that their science was not subject to politics is counter to the call many scientists or scientific advocates resound of science is political (Shearer et al., 2020). We theorize that these aspects are not what allow for scientists to make connections with audiences at comic cons. After all, political polarization and politically-induced status quo bias are based in "traditional" science communication efforts in which people are coming to events and spaces with the goal or understanding of seeking out science. These political components of theoretically-based science communication do not account for the ways that interest can modify the science communication experience.

Conclusion

This research focused on understanding how cosplaying scientists communicated science within the everyday spaces of comic cons. We found that scientists tended to use stories and frame science as interest-based as opposed to exploring ways that science topics could be integrated with (or divorced from) political views. We add to understanding about theoretically-based science communication in spaces where people are not necessarily seeking to learn about science or interact with scientists. This addition is important, as most science communication research occurs in places where people actively go to gain science content such as museums, science cafes, and science festivals. Our future research will further explore science communicators' identity and how it affects participating in communicating science in "everyday spaces" such as comic cons and if there are regional differences in regards to science communication at comic cons as well as build on our previous understanding through incorporating perspectives from audiences who visit pop-up museum booths at comic cons.

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Declaration of interest statement

The authors have no conflicts of interest to disclose.

Ethics statement

This data was collected under University IRB protocol #XXXX [blinded for review].

Supplementary material

Supplemental material for this manuscript may be found at https://osf.io/vf8ne/?view_only=7366967881d045ea9671bf71633d2414. Supplemental material includes the informed consent survey asked of scientists, observation protocol, and semi-structured interview questions. Interview and observation data are available by request.

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Table 1. Pseudonyms and demographics of participating cosplaying scientists

Pseudonym	Scientific expertise	Age range	Gender	Sexual orientation	Ethnic heritage
Keo	Astronomy	25-34	Agender	Aromantic, Asexual	White
Maz	Astronomy	18-24	Woman	Bisexual	Asian, White
Leia	Chemistry	25-34	Woman	Straight	Asian, White
Tala	Earth Science	25-34	Woman	Straight	Asian
Ashoka	Herpetology	25-34	Woman	Fluid	Black
Jyn	Biomedical engineering	25-24	Women	Queer	Asian, White
Bantha	Paleontology	25-34	Nonbinary	Queer	Hispanic
Ben	Paleontology	18-24	Man	Straight	Hispanic, White
Cassian	Paleontology	25-34	Man	Straight	White
Drake	Paleontology	25-34	Man	Bisexual	Asian
Ezra	Paleontology	25-34	Man	Straight	White
Hera	Paleontology	25-34	Genderqueer	Pansexual	White
Max	Paleontology	25-34	Man	Straight	Hispanic, White
Luke	Plant sciences	25-34	Man	Bisexual	White
Sabine	Psychology	25-34	Woman	Straight	White

Table 2. Coding Framework, Description, and Number of Codes

Code	Code Description	Interviews	Observations	Total
Effective framing (EF)	emphasizes specific components of information that can be used to help people construct opinions	71	41	112
EF: Politically-induced status quo bias	framing science as consensus-based to overcome narratives that are created by politicians to uphold existing state of affairs	10	1	11
EF: Political polarization	framing information so people pay attention to the informational content of science-based messages so they can reconcile their politized beliefs with scientific consensus	17	3	20
EF: Competition for attention	ways that scientists can supply pieces of information that can take the place of other extensive information (i.e. heuristics) to simplify decision-making	65	48	113
Narrative Structure (NS)	the cause-and-effect relationships between events that take place over a particular time period that impact particular characters	26	16	42
NS: Temporality	an identifiable structure (beginning, middle, end) where events are related	44	13	57
NS: Character (C)	includes actors (humans or otherwise) that act within a narrative	8	18	26
NS-C: Character in cosplay	a scientist or the person they're interacting with is a character (ex. Leia costume)	25	0	25
NS-C: Character in a story	a scientist uses a character in a story (ex. A jedi)	42	0	42
NS-C: Reflection on interaction	an interaction with a visitor OR another scientist who was meaningful to them (ex. Drake got me into cosplay)	29	0	29
NS: Causality	statements that are linked to each other by successive causes and consequences	66	30	96
Other	participant describes something that does not fit into other codes but is worth noting	99	29	128
Total		502	199	701