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Engaging Audiences with Behind-the-Scenes Science Media

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ABSTRACT

This study explores the potential benefits of different formats of behind-the-scenes content for educational science media using the Differential Susceptibility to Media Effects Model. We also consider potential gender differences in response to the behind-the-scenes content and the influence of using an on-camera host versus a solely voiced-over production. The results suggest that professionally produced behind-the-scenes content may help broaden participation with science media; that is, we found that these types of behind-the-scenes content increase engagement with science video among women who score lower in science curiosity.

Introduction

Social media and branding experts recommend using behind-the-scenes content to increase trust by showcasing transparency (Ciocia, 2017; Sklar, 2019). They define behind-the-scenes content as semi-unpolished content that shows audiences the culture, management, and everyday workings of the business. The professional judgment of these organizations is that promoting behind-the-scenes content helps cultivate a personal connection with consumers, create brand authenticity, and increase engagement (Daniels, 2014; O'Brien, 2018). Yet, little to no academic research exists to support these claims.

Giving audiences a behind-the-scenes peek into the production of a television program or film dates back to early cinema (Arthur, 2004; Hight, 2005). The strategy was to provide content about production mechanics to increase anticipation for and promote a film. Starting in

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1919, and for over 30 years, film studio Columbia ran behind-the-scenes tidbits called *Screen Snapshots*. By the 1930s, most major film studios provided “making-of” featurettes that also introduced new actors or displayed new advancements in production technology, such as color (Arthur, 2004). In the 1950s, ABC tacked onto each episode of *Warner Bros Presents* a short segment called “Behind the Cameras” that gave audiences a glance at Hollywood studio sets and showcased interviews with movie stars like John Wayne (Anderson, 1994). Behind-the-scenes featurettes highlighting elements like still images, “diary” footage, outtakes, screen tests, and interviews appeared occasionally into the sixties and materialized rapidly during the emergence of DVDs and cable television (Arthur, 2004).

Goffman’s (1971) dramaturgical theory of self and society and Meyrowitz (1979) metaphorically likened the distinction between a feature film and the associated behind-the-scenes “making-of” documentary to a theatrical performance. On the front stage, audiences witness actors perform their roles. However, backstage is where the performers plot their strategies and can relax; here, audiences only learn of the feature’s scheme if admitted behind the scenes. Goffman says that producers control access to these two regions to prevent the unintended viewing of the backstage. For instance, Evans (2010) explained that in the 1980 film *Superman: The Movie*, actor Christopher Reeves was reluctant to reveal how the studio achieved the special effect of him flying, fearing that doing so would ruin the viewing experience for the audience. However, Meyrowitz concluded that it is in the gaining of backstage access where audiences may perceive individuals’ behavior as more authentic than onstage actions. Meyrowitz writes, “Indeed, the discovery of contradictory back region behavior is often thought of as the foolproof method for unmasking the spy, the con man, and other dishonest performers” (p. 48). Evans referred to behind-the-scenes documentaries as “pseudo backstages” (p. 595). So, rather than holding back information as *Superman* actor Reeves preferred four decades ago, Evans stated that a newer strategy in behind-the-scenes documentary releases is to give viewers an abundance of backstage information on all production aspects.

Contemporary brand marketing experts echo a similar sentiment that providing behind-the-scenes content benefits both media creators and consumers (Ciocia, 2017; Narmadhaa, 2019; O’Brien, 2018; Sklar, 2019; “Why you need these,” 2018). Behind-the-scenes content may help producers maintain a broader and more loyal audience; providing a backstage view may aid in humanizing a brand while increasing engagement in the form of likes, shares, and comments. Viewing behind-the-scenes material also showcases product transparency, providing an authentic way of showcasing the production process to the audience (Narmadhaa, 2019).

This study explores the potential benefits of different formats of behind-the-scenes content for high-quality science video among different audiences using the Differential Susceptibility to Media Effects Model (DSMM, Valkenburg & Peter, 2013). Furthermore, we set out to contribute to theory by using mediation models that could explain *how* behind-the-scenes content may increase engagement with educational science media through the perception of content authenticity. The programing we use comes from the online nature series *Deep Look*, produced by KQED public media in San Francisco, Ca. The *Deep Look* YouTube channel has more than 100 episodes and over 1.7 million subscribers. Men account for approximately 67% of *Deep Look*'s YouTube total views and 83% when averaged across episodes (C. Rosa, personal communication, April 4, 2020). Therefore, we also consider potential gender differences in response to behind-the-scenes content and whether certain behind-the-scenes formats may help close the gender gap among new audiences.

Authenticity and Engagement

Behind-the-scenes content may influence how *authentic* an individual perceives the channel and its content. Scholars have conceptualized authenticity in terms of the truthfulness or realness of a product that, as a result, affects how much trust consumers have in a brand and the growth of the brand within the marketplace (Napoli et al., 2014). Survey data collected by Napoli et al. (2014) found a positive correlation between the authenticity rating of a brand and the perceived level of trust in (Delgado-Ballester, 2004) and credibility of (Kirmani, 1997) the brand among consumers. Here, we conceptualize authenticity as first-time viewers' perceptions of trustworthiness and credibility regarding the *Deep Look* program. Specifically, we expect that giving audiences a look behind the scenes will boost audiences' perceptions of authenticity as viewers get a peek at what goes into making the episode.

Behind-the-scenes content may also increase perceptions of authenticity given that it closely approximates user-generated content. YouTube started as an online platform where amateurs could upload almost any video, which came to be known as *user-generated content* (Kim, 2012). Indeed, users upload more than 500 hours of video on YouTube every minute (Larsen, 2020). Traditional network broadcasters and large-scale media groups, too, realized that they could use the online video giant as another medium for their content; this transformed YouTube into a digital venue where professionally generated content became a prevalent video format (Kim, 2012). Interestingly, researchers report that user-generated content is more popular than professionally generated content, especially on YouTube (Welbourne & Grant, 2016). Focus

group research following up on why some individuals laud news-based user-generated content found that their participants perceive a member of the public's photos, film, or reporting of an incident to be more believable than that from professional organizations (Wahl-Jorgensen et al., 2010). A separate study suggested YouTube videos strongly resonate with a younger demographic (teenagers and preteens) because they find the authenticity of amateur user-generated content relatable (Holland, 2016). Likewise, as one researcher succinctly put it, "amateur video may be closer to the audience and better at representing emerging tastes simply because it is made by the audience" (Strangelove, 2010, p. 168).

Also, brand marketers attest that projecting authenticity builds trust in a brand and increases user engagement (Alton, 2018; Mortensen, 2020; Scott, 2020). In a survey of US, UK, and Australian adults, 86% of participants stated that brand authenticity is crucial to their decision to like and support a product, 57% stated that fewer than half of brands develop online content that appears authentic, and 60% stated that they see user-generated content as most authentic (Cassidy, 2017; The consumer content report, n.d.). Likewise, a 2014 survey of global consumers found that 91% of consumers reported purchasing from, investing in, or endorsing a brand they perceived as authentic (Mattos, 2015). Increased trust in a brand also can lead consumers to recommend or use more of its services and products (Eggers et al., 2012).

Reading, sharing, and "liking" posts on companies' social media pages are also indicators of engagement, and research suggests that audience perceptions of credibility, such as how believable a consumer perceives a company's intentions (Herbig & Milewicz, 1993), influences consumers' expectations of their online behavior. For example, Keib and Wojdyski (2019) asked study participants to rate several Facebook posts on perceived credibility and whether they would like to read more, like, or share the post. The results showed that consumers were more willing to engage with content that they felt was more credible.

Differential Susceptibility to Media Effects Model

The hypotheses for this study come from placing our research questions about the potential effects of behind-the-scenes content on authenticity and engagement into Valkenburg and Peter's (2013) Differential Susceptibility to Media Effects Model (DSMM). The DSMM builds on other media-effects theories (e.g., Social Cognitive Theory, Selective Exposure Theory) and can provide insight into modeling how audiences' characteristics, like their gender and science curiosity, may influence their selection of and response to certain videos. The DSMM has four

related propositions: First, it embraces the concept that individual differences and social factors can enhance or reduce a media effect. Second, it states that media effects are most evident when a person's cognitive, emotional, and excitatory response states are high. Third, it postulates that a person's dispositional, developmental, and social factors can predict the type of media one uses (role 1) and moderate the relationship between media use and people's responses to that media (role 2). Fourth, it states that media effects are transactional and influence future media use, media response states, and predictors of media use. The four components of the DSMM involved in these propositions are (a) cognitive, emotional, and/or excitative response states, (b) media use, (c) the dispositional, developmental, and/or social individual difference variables, and (d) media effects. Below, we discuss how we operationalize these components for this study.

Response States

The outcome variables for the current study are the response states elicited by exposure to the video content. We hypothesized that, in addition to increasing engagement, behind-the-scenes content might make audiences evaluate the *Deep Look* brand as more authentic (a cognitive response).

Hypothesis 1. Participants exposed to behind-the-scenes content appended to a *Deep Look* episode will report greater perceptions of authenticity than those who view the original episode alone.

Hypothesis 2. Participants exposed to behind-the-scenes content appended to a *Deep Look* episode will report greater demonstrations of engagement than those who view the original episode alone.

Furthermore, we expect that exposure to behind-the-scenes content will lead to greater engagement with the content because such exposure will increase audiences' perceptions of authenticity which will in turn influence engagement (DSMM proposition 2; also see Baron & Kenny, 1986). Therefore, we propose the following:

Hypothesis 3. Participants' perceptions of authenticity will mediate the relationship between exposure to behind-the-scenes content and engagement.

Dispositional Variables

The present study also focuses on how individual variables may interact with media use to influence people's response states (DSMM Proposition 3, role 2). We are particularly interested in the

*dispositional*¹ variables of science curiosity and gender. These variables were chosen based on prior work aiming to identify the missing audience for educational science content. The Science Curiosity Scale (Kahan et al., 2017) captures one's motivation to seek out and engage with science media for personal pleasure. It strongly predicts engagement indicators, for example, how long one will watch a science documentary and how interesting they find it (Kahan et al., 2017). Consistent with this prior research and the DSMM proposition 3 (role 2), we hypothesize that:

Hypothesis 4_{ab}. The relationship between exposure to behind-the-scenes content and (a) authenticity and (b) engagement will be conditional on participants' science curiosity and gender.²

Media Use

In the DSMM, media use can be operationalized in many ways, from exposure to certain content to the duration of media use (Valkenburg & Peter, 2013). In this study, we manipulated which types of behind-the-scenes content participants saw.

Produced Behind-the-scenes Episodes

In addition to their original episodes, *Deep Look* created a handful of behind-the-scenes episodes that are on par with the production quality of their original episodes. For this study, we refer to these as “produced” behind-the-scenes episodes. These produced behind-the-scenes episodes provide audiences with an inside look into how the filming crew employed skillful cinematography techniques to capture very small creatures' unique movements and behaviors, some on the near-microscopic level. The *Deep Look* producers state that their purpose in creating these behind-the-scenes episodes is to provide more opportunities to engage *Deep Look* fans, but it comes at a cost. Producing the behind-the-scenes footage requires additional human resources and work hours, luxuries most public media outlets do not have. As a result, the producers wonder what benefits arise from crafting behind-the-scenes content and whether there are more cost-efficient ways to gain these benefits. Therefore, we ask

¹According to the DSMM, dispositional susceptibility includes all person dimensions, such as gender, temperament, personality, cognitions, attitudes, values, beliefs, motivations, and moods (Valkenburg & Peter, 2013).

²Note that samples of less than 2,000 participants collected to approximate national representativeness often have only a very small number of participants who identify as gender diverse (e.g., non-binary, transgender, gender nonconforming, pangender, genderqueer, etc). It is not appropriate to generalize from such small sample sizes nor to group gender diverse individuals together as if they were one population. Therefore, we focus only on people who identified themselves on our survey as male or female.

RQ1. Does exposure to a professionally produced behind-the-scenes episode appended to a *Deep Look* episode increase perceptions of authenticity and demonstrations of engagement more than other types of behind-the-scenes content?

“Unproduced” Behind-the-scenes Video

Earlier, we mentioned the popularity of user-generated content over professionally generated content on YouTube (Welbourne & Grant, 2016) and how such user-generated content may be seen as more authentic than professionally generated content (Wahl-Jorgensen et al., 2010). As of this study, all *Deep Look* content posted on its YouTube channel, including the behind-the-scenes episodes, were professionally shot, produced, and edited. Creating behind-the-scenes content that is raw, less edited, and/or shorter in duration not only is less resource-intensive than creating the professionally produced content, but it may more closely resemble the arguably more popular user-generated content. Thus, we ask:

RQ2. Would *less* professionally produced content increase perceptions of the program’s authenticity and audience engagement compared to watching professionally produced behind-the-scenes content?

Behind-the-scenes Slideshows

An even less resource-intensive way to provide behind-the-scenes content is via slideshows. Filming and editing video onsite may require more time (e.g., video sequencing, color grading, and adjusting audio levels) than taking a few photos and assembling them on an editing software timeline to create a slideshow. If empirical research shows that viewers engage similarly (or more) with an episode that includes a behind-the-scenes slideshow than one with produced or unproduced behind-the-scenes video appended at the end, producers may consider creating behind-the-scenes slideshows as a cost-effective alternative. Accordingly, we ask:

RQ3. How does watching a behind-the-scenes slideshow compare with watching other types of behind-the-scenes content (especially produced vs. unproduced video)?

Narrator Stand-up

If behind-the-scenes content increases perceptions of authenticity and demonstrations of engagement, is it because it is “behind-the-scenes,” or is it because audiences saw a face on camera? After all, another factor that research has suggested improves the authenticity of a YouTube channel is the presence of a regular host (Burgess & Green, 2009). Among several factors that improve the trustworthiness of a source is having an *affinity* with the media personality and perceptions of media personnel’s *expertise* and *experience* (Heath et al., 2007).

Along similar lines, research suggests that whether a YouTube user only hears the voice of the science video's narrator or also sees them appear on camera influences engagement. Amarasekara and Grant (2019) found, for example, that viewers subscribed to female-hosted science channels at a significantly higher rate than those that have only a voiceover of a female host, a voiceover of a male host, or a visible male host. Female-hosted channels also received significantly more likes per view than male or female voiced-over videos. Moreover, viewers commented on female-hosted channels significantly more than those hosted or voiced-over by a male (though the online discussions had a high proportion of sexual remarks and comments about the hosts' appearance). Subscription, liking, and commenting are three common indicators of user engagement (e.g., Ksiazek et al., 2016). Thus, we ask:

RQ4. Will seeing a narrator appear on camera to introduce the original episode (i.e., a "stand-up") increase participants' perceptions of authenticity and demonstrations of engagement compared to the original video and the behind-the-scenes content?

Method

Design

To test the hypotheses, also depicted in Figure 1, we conducted a between-subjects survey experiment, in which we randomly assigned respondents to view one of 5 treatments of *Deep Look* video clips (i.e., original voiced-over episode, original episode with unproduced behind-the-scenes video, original episode with produced behind-the-scenes video, original episode with behind-the-scenes slideshow, and original episode with an on-screen introduction by the narrator). Moreover, participants saw one of two stories: an episode about sand dollars or decorator crabs.

Participants

We contracted Qualtrics Research Services to recruit 1,000 participants. Qualtrics used quota sampling to approximate U.S. census values based on potential participants' gender, race/ethnicity, and age. The final sample was 1,045 respondents: 45% male, 54% female, 65% White, 14% Black, 17% Hispanic/Latino, and 6% Asian. The average age of the sample is 46.17 (*Median* = 46 years old, *SD* = 17.98).

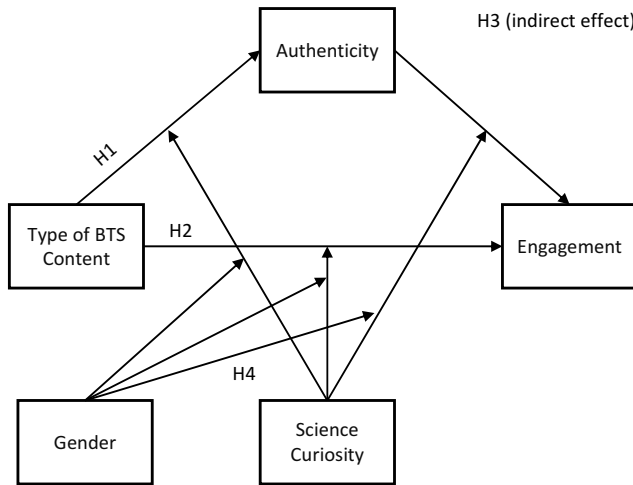


Figure 1. Model of the hypothesized relationships between variables in the study. The type of behind-the-scenes content, which is a categorical variable, is analyzed using indicator coding, comparing each of the types of behind-the-scenes content against the original episode alone.

Stimulus Material

The two *Deep Look* episodes we use as stimuli each have a professionally produced behind-the-scenes video uploaded on the series' YouTube channel and Facebook Watch page as a standalone episode.

The original *Deep Look* episode titled “A Sand Dollar’s Breakfast is Totally Metal” showcased what living sand dollars appear like underwater and their unusual diet (Deep Look, 2018). In the *produced* behind-the-scenes condition, the related produced behind-the-scenes video (Deep Look, 2019) was attached to the end of the original episode. The produced behind-the-scenes video was narrated and followed the cinematographer and lead producer as they filmed living sand dollars on the ocean floor. In the *unproduced* condition, we attached raw video footage of the producer taking pictures under water in scuba gear. In the *pictures* condition, we attached a slideshow of three photos showing the production team smiling at the camera and wearing their underwater gear. In the *stand-up* condition, the female host of *Deep Look* appeared on camera to introduce the original episode.

The second episode, “Decorator Crabs Make High Fashion at Low Tide,” showed how the decorator crab uses seaweed and sea anemone to blend into its environment (Deep Look, 2017a). In the *produced* condition, we attached the produced behind-the-scenes video of the episode (Deep Look, 2017b) that included voiceover and soundbites of interviews from the various production team members. In the *unproduced* condition, we attached raw

video footage of the crustacean and a conversation between a biologist and *Deep Look* team members about how to film the decorator crab. In the *pictures* condition, we attached a slideshow of four photos showing the team filming in a northern California bay. Finally, in the *stand-up* condition, the female host of *Deep Look* appeared on camera to introduce the episode (just as for the sand dollar video).

Procedure

We created the online questionnaire using Qualtrics survey software. Participants first completed the science curiosity questionnaire (Kahan et al., 2017) and were then randomly assigned to one of the ten treatment conditions described earlier. Next, participants were introduced to the video.

We embedded a timer in the survey software that prevented respondents from advancing until the video ended. Although it is impossible to know whether respondents watched the video in its entirety, we asked participants how closely they paid attention to the video; this question was included as part of our engagement index.

After the video, participants answered questions, including those designed to capture how authentic they perceived *Deep Look*'s identity (i.e., Authenticity) and how engaged they were with the content (i.e., Engagement). Finally, participants answered a series of standard demographic questions.³

Measures

Authenticity

We modified and combined the brand trust (Delgado-Ballester, 2004) and brand credibility (Kirmani, 1997) scales to create a measure of perceived program authenticity. The adjustments simply consisted of changing the generic term "brand" to the *Deep Look* title. The scale consisted of eight items, such as "I feel confident in the quality of *Deep Look*" and "I think *Deep Look* is trustworthy." A scree test and non-graphical solutions suggested this authenticity scale was unidimensional. The inter-item reliability was good (Cronbach's $\alpha = 0.87$, 95% CI[0.85, 0.88]). We used item response theory to further evaluate and score the scale, and authenticity scores ranged from -3.06 to 1.74 ($M = 0.04$, $SD = 0.87$, skew = 0.01).

³Demographic items used for quota sampling were asked at the beginning of the survey on the consent page. The remaining demographic questions were at the end of the survey.

Engagement

We measured engagement using both subjective and behavioral indicators. For example, we asked respondents how informative and interesting they found the video. We also asked respondents if they had any questions about the information discussed in the video, and if they did, to list up to 10. In addition, we asked respondents if they would be interested in sharing the video on social media, receiving e-mail updates about new episodes, and whether they would like to comment on the *Deep Look* episode they watched. If they said yes, we told them that we would provide links at the end of the survey that they could use. We combined the subjective and behavioral engagement measures using item response theory. Scores were close to being normally distributed but with a slight negative skew (skew = -0.2) and ranged from -2.81 to 2.3 ($M = 0.0$, $SD = 0.92$).

Science Curiosity

We measured science curiosity using the science curiosity scale (Kahan et al., 2017). Consistent with prior work (e.g., Kahan et al., 2017), we calculated science curiosity scores using item response theory, and the scores were approximately normally distributed ($M = 0.01$, $SD = 0.95$, skew = -0.2).

Results

The focus of this study was to examine if there are measurable differences between individuals who watch only the original episode compared to viewing the episode with the inclusion of behind-the-scenes content or an on-camera introduction by the host. We began by conducting preliminary *t*-tests and ANOVAs comparing scores on the outcome variables among participants in the behind-the-scenes conditions (i.e., produced video, unproduced video, and slideshow) to participants in the non-behind-the-scenes conditions (i.e., the stand-up introduction and the original video alone). Then, we analyzed the data in SPSS using PROCESS model 73, with the type of behind-the-scenes content⁴ as a multi-categorical X variable, authenticity as the mediator (M), and engagement as the outcome variable (Y). Model 73 also has two moderating variables; we used science curiosity (W) and gender (Z). One benefit of using PROCESS is that the output includes relative conditional direct and indirect effects. This allows us to report potential effects on men and women who scored lower (-1 SD), average (0 SD), and higher ($+1$ SD) on our science curiosity measure. See the online supplementary materials at <https://osf.io/r974s/> for the full results tables.

⁴We used indicator coding with the original episode alone as the referent.

Preliminary Analyses

Predicting Authenticity

Supporting hypothesis 1, average *authenticity* scores were statistically greater for participants in the behind-the-scenes conditions ($M = 0.10$, $SD = 0.88$, $Median = 0.08$) than for participants in the non-behind-the-scenes conditions ($M = -0.03$, $SD = 0.85$, $Median = -0.04$), $t(1030.1) = 2.41$, $p = .016$, Cohen's $d = .15$. However, the 5 (Video Type: Original, Produced, Unproduced, Pictures, Stand-up) by 2 (Story: crabs, sand dollar) ANOVA found no main effect of video type, $F(4, 1035) = 1.79$, $p = .129$, or story, $F(1, 1035) = 0.01$, $p = .925$, and the interaction between the two was marginal but not statistically significant, $F(4, 1035) = 2.28$, $p = .059$. When including science curiosity and gender into the model, though, we find a significant video type by science curiosity score by gender interaction, $F(4, 964) = 3.48$, $p = .008$. See [Figure 2](#). These results suggest that whether perceptions of authenticity increase based on the type of behind-the-scenes content watched is conditional on participants' science curiosity and gender. We investigate these conditional effects with the process model.

Predicting Engagement

Supporting hypothesis 2, average *engagement* scores were statistically greater in the behind-the-scenes conditions ($M = 0.06$, $SD = 0.90$, $Median = 0.13$) than in the non-behind-the-scenes conditions ($M = -0.08$, $SD = 0.93$, $Median = -0.06$), $t(1007) = 2.32$, $p = .021$, Cohen's $d = .15$. Also, like authenticity, however, the ANOVA found no main effect of video type on engagement, $F(4, 1035) = 1.49$, $p = .204$, or story, $F(1, 1035) = 0.50$, $p = .482$, and the interaction between the two was not statistically significant, $F(4, 1035) = 1.61$, $p = .170$. And, when including science curiosity and gender into the model, we find a significant three-way interaction between video type, science curiosity score, and gender, $F(4, 964) = 2.67$, $p = .031$. These results suggest that, like perceived authenticity, whether engagement increases based on the type of behind-the-scenes content watched is conditional on participants' science curiosity and gender. Note that these analyses did not include authenticity scores when predicting engagement. This is examined with the process model.

The next set of analyses evaluate the complex interactions we predicted based on the DSMM, where science curiosity and gender moderate any effects of behind-the-scenes exposure on authenticity and engagement. Furthermore, we examine whether authenticity mediates the relationship between the relative influence of different types of behind-the-scenes exposure (compared to the original video) and participant engagement scores.

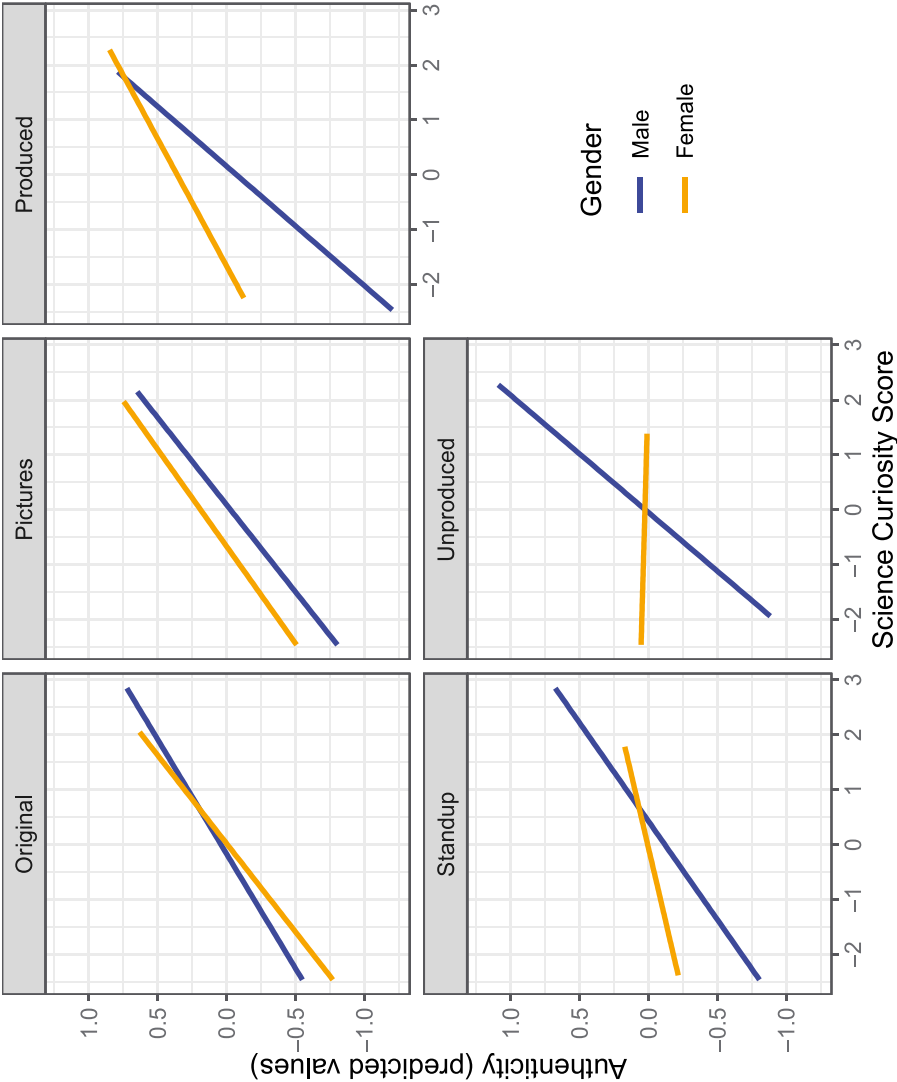


Figure 2. Significant three-way interaction between science curiosity score, type of behind-the-scenes content, and gender (Male, Female) on perceived authenticity of the Deep Look brand.

Process Model

This model tests for the relative direct and indirect effects of type of behind-the-scenes content through authenticity on engagement. See Figure 1. This analysis found that participants who saw the produced behind-the-scenes video ($M = 0.15$, $SD = 0.88$) reported greater perceived authenticity scores than participants who saw the original episode alone ($M = -0.01$, $SD = 0.88$, $d = 0.18$), $b = .365$, 95% CI[.130, .594], $p = .001$. There was also a significant interaction between the unproduced video (vs. the original episode alone) and science curiosity ($b = -0.32$, 95% CI[-0.63, -0.02], $p = .009$): the positive association between science curiosity and perceived authenticity was stronger for participants who saw the original episode ($r = .32$) compared to those who watched the episode with the unproduced behind-the-scenes footage ($r = .23$).

Moreover, the highest order unconditional interaction between type of behind-the-scenes content, science curiosity, and gender on authenticity was significant, $F(4, 984) = 2.96$, $p = .019$, consistent with the finding from the preliminary analysis. See Figure 2. Probing the conditional effects, we find that the effects exist primarily among women lower in science curiosity. Specifically, greater authenticity was reported among women with low science curiosity who saw the produced ($M = 0.15$, $p = .004$) or the unproduced ($M = 0.04$, $p = .026$) behind-the-scenes content, compared to low science-curious women who saw the original episode alone ($M = -0.30$). Similarly, greater authenticity was reported among women with average science curiosity who saw the produced behind-the-scenes video ($M = 0.36$, $p = .001$) compared to similar women who saw the original video ($M = -0.01$). There were no differences among women with higher science curiosity or among men generally. See Table 1.

Table 1. Conditional effects of the focal predictor (type of behind-the-scenes content) on the mediator (authenticity) among men and women of low and high science curiosity. For the purposes of this analysis, high science curiosity is one standard deviation above the mean and low science curiosity is one standard deviation below the mean.

	High Science-Curious Women		High Science-curious Men	
vs. Original	<i>Effect</i>	<i>95% CI</i>	<i>Effect</i>	<i>95% CI</i>
Stand-up	-.197	[-.527, .132]	-.122	[-.403, .158]
Pictures	.168	[-.161, .498]	.003	[-.276, .282]
Produced	.247	[-.063, .610]	.098	[-.204, .400]
Unproduced	-.277	[-.604, .051]	.201	[-.090, .492]
	Low Science-curious Women		Low Science-curious Men	
vs. Original	<i>Effect</i>	<i>95% CI</i>	<i>Effect</i>	<i>95% CI</i>
Stand-up	.216	[-.074, .507]	-.197	[-.502, .109]
Pictures	.221	[-.056, .499]	-.140	[-.460, .180]
Produced	.454**	[.142, .767]	-.320	[-.656, .017]
Unproduced	.335*	[.039, .631]	-.233	[-.578, .112]

*** $p < .001$, ** $p < .01$, * $p < .05$

Notably, none of the behind-the-scenes content types varied significantly from the original video when predicting engagement (Hypothesis 2). However, there were interaction effects supporting Hypothesis 4. For instance, there was a three-way *conditional* interaction between the photo slideshow (vs. the original episode alone), science curiosity, and gender, $b = 0.29$, 95% CI[0.02, 0.58], $p = .033$. But, the highest order unconditional interaction between type of behind-the-scenes content, science curiosity, and gender was not significant, $F(4, 980) = 1.17$, $p = .323$. Aside from the effects related to the type of behind-the-scenes content, authenticity was positively associated with engagement ($b = .560$, 95% CI[.486, .638], $p < .001$). Gender also predicted engagement ($b = -.30$, 95% CI[-0.47, -0.14], $p < .001$): among survey participants, women ($M = 0.09$, $SD = 0.89$) scored higher on our index of engagement than men ($M = -0.09$, $SD = 0.93$, $d = 0.20$).

Supporting hypothesis 3 (and 4), there were two relative conditional *indirect* effects of the produced behind-the-scenes video (compared to the original episode alone) through authenticity on engagement: for women of low ($b = 0.28$, 95% CI[0.08, 0.50]) and for those with average science curiosity ($b = 0.20$, 95% CI [0.07, 0.34]). See Figure 3. Furthermore, pairwise comparisons of indirect effects suggest that the effect for females with low science curiosity was significantly greater than that for men with low science curiosity ($b_{\text{Low_SCS_Men}} = -0.21$, contrast = 0.45, 95% CI[0.19, 0.82]) and that of men with average science curiosity ($b_{\text{Avg_SCS_Men}} = -0.07$, contrast = 0.35, 95% CI[0.10, 0.60]). The indirect effect for women with average science curiosity was significantly greater than that of men with low science curiosity (contrast = 0.42, 95% CI[0.16, 0.69]) as well as men with average science curiosity (contrast = 0.27, 95% CI[0.08, 0.46]).

Comparing Produced versus Unproduced Video and Behind-the-scenes Slideshow

In addition to the hypothesized model comparing behind-the-scenes content types to the original episode, we wanted to conduct a follow-up PROCESS analysis that directly compares the produced video to the unproduced video and to the slideshow. We found that participants who saw the produced video ($M = 0.15$, $SD = 0.88$) reported slightly greater perceived authenticity scores than participants who saw the unproduced video ($M = 0.06$, $SD = 0.91$, $d = 0.10$), $b = 0.33$, 95% CI[0.07, 0.59], $p = .008$. This effect of type of behind-the-scenes content on authenticity was conditional on gender, $b = -0.43$, 95% CI[-0.80, -0.08], $p = .020$. Among women, perceived authenticity scores were greater after having watched the produced behind-the-scenes video ($M = 0.35$, $SD = 0.88$) than after having watched unproduced video ($M = 0.02$, $SD = 0.88$, $d = 0.38$). Among men, the reverse was true: perceived authenticity scores were greater after having watched unproduced behind-

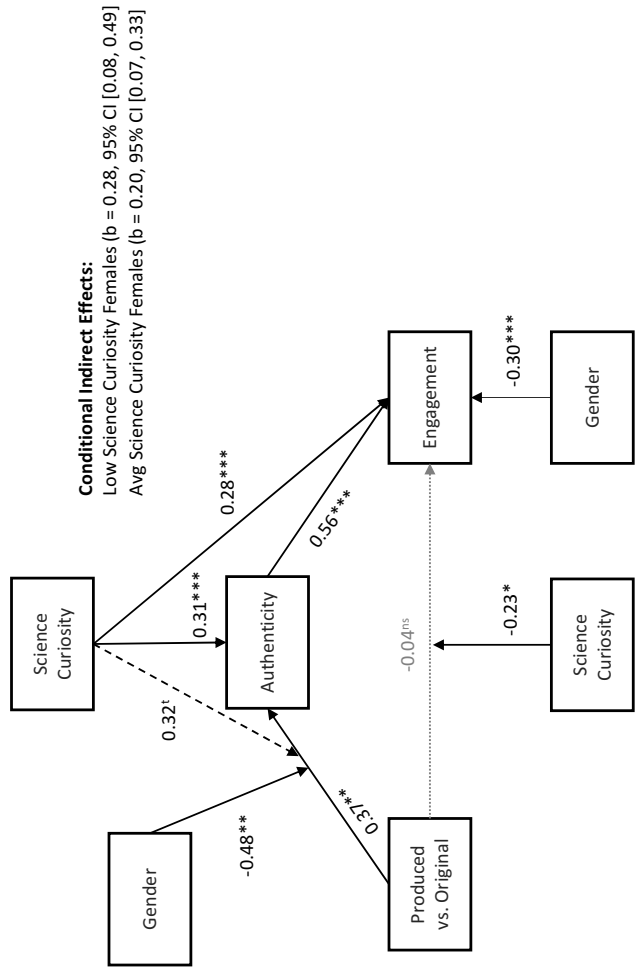


Figure 3. Process model comparing only the produced behind-the-scenes video condition to the original video condition. Statistical significance of paths indicated by asterisks: *** $p < .001$, ** $p < .01$, * $p < .05$.

the-scenes video ($M = -0.03$, $SD = 0.84$) than after having watched the produced video ($M = 0.11$, $SD = 0.95$, $d = 0.16$). There were no significant effects of this behind-the-scenes comparison on engagement. However, there were two significant indirect effects: one among women of average science curiosity ($b = -0.17$, 95% CI $[-0.31, -0.04]$) and one among women of high science curiosity ($b = -0.23$, 95% CI $[-0.45, -0.05]$). Pairwise comparisons of the indirect effects suggest that the effect for women with average science curiosity is significantly different from men of average science curiosity ($b_{\text{Avg_SCS_Men}} = 0.06$, contrast = 0.23, 95% CI $[0.03, 0.44]$) and the effect among women with high science curiosity is significantly different from men of high science curiosity ($b_{\text{High_SCS_Men}} = 0.06$, contrast = 0.29, 95% CI $[0.03, 0.59]$).

Unlike for the comparison with unproduced content, we found no significant difference in perceived authenticity scores among participants who saw the produced behind-the-scenes video ($M = 0.15$, $SD = 0.88$) compared to participants who saw the slideshow ($M = 0.10$, $SD = 0.86$, $d = 0.06$), $b = -0.17$, 95% CI $[-0.41, 0.07]$, $p = .166$. None of the interaction effects with behind-the-scenes type (produced video compared with slideshow) were significant. There were no significant effects of this behind-the-scenes comparison on engagement, and there were no significant indirect effects.

Discussion

The purpose of this study was to explore the potential benefits of different formats of behind-the-scenes content for engaging audiences with digital science video. Specifically, we examined how men and women perceive the authenticity of and engage with science videos when exposed to variations of professionally produced or less polished behind-the-scenes material compared to those who only view the original episode. Guided by the DSMM, the study results highlight the significant role that audiences' gender and science curiosity play, at least in some instances, in moderating responses to different types of behind-the-scenes content.

Behind-the-scenes Content Increases Perceived Authenticity among Some Audiences

Communicators who use social media may need to demonstrate, more than ever before, the authenticity of their product as allegations and prevalence of "fake news" increase in online media (Lazer et al., 2018). Although some social media experts believe that behind-the-scenes content has the potential to increase audiences' perceptions of a brand's authenticity (hypothesis 1), we found that this is the case only among some audiences. When combining the three behind-the-scenes conditions together and the two non-behind-the-

-scenes conditions together (i.e., the original video and stand-up conditions), there was a statistically significant difference between the groups' mean authenticity scores. Although none of the behind-the-scenes conditions significantly varied from the original video condition in perceived authenticity across all audiences, there were effects among certain audience groups broken out by science curiosity and gender (consistent with the DSMM model, i.e., hypothesis 4). Notably, low science-curious women in the sample reported greater authenticity scores, on average, when they saw either the produced or unproduced behind-the-scenes content compared to similar women who saw the original episode alone.

In fact, part of our first research question asked whether exposure to a professionally produced behind-the-scenes video appended to a *Deep Look* episode increases perceptions of authenticity more than other types of behind-the-scenes content. We found that this was true only when comparing the produced condition to the unproduced condition and original video condition. Furthermore, this effect for produced versus unproduced content varied by gender: female participants generally perceived the *Deep Look* episode with professionally produced behind-the-scenes content as more authentic than the episode with unproduced behind-the-scenes video (whereas male participants perceived the opposite). Thus, our study results suggest that media makers who want to increase perceptions of authenticity among women using behind-the-scenes video ought to consider professionally producing such content.

Behind-the-scenes Content Might "Broaden Participation" with Science Video

Furthermore, a key finding of this study suggests that watching a professionally produced behind-the-scenes video appended to a *Deep Look* episode may increase *engagement* among women with low and average science curiosity by increasing their perceptions of the brand's authenticity. See [Figure 3](#). As stated earlier, people of lower science curiosity have not been part of the target audience for high-quality science videos due to their (presumed) lack of interest in the topic. This does not mean, however, that they are not a worthwhile audience to engage. A plethora of research and funding initiatives exist to broaden participation with STEM (e.g., Bevan et al., 2018). Our findings suggest that women with lower science curiosity may be reachable audiences for science video if enticed with professionally produced behind-the-scenes content.

This result should be approached with healthy skepticism, however. There are several reasons why our findings may not replicate in the real world. For example, we would not let participants in the study advance to the next part of the survey until enough time had passed to watch the original video and

the appended behind-the-scenes content. Prior work suggests that low science-curious women often choose not to watch science videos when given a choice in an experiment (Kahan, 2019). Future research ought to examine other potential avenues for delivering behind-the-scenes content that is not dependent on watching the original video first. For instance, it is possible that using behind-the-scenes slideshows or videos on social media may help draw new audiences to the original episode.

Seeing a Host on Screen May Not Be More Beneficial than a Voice-only Narration

We also tested whether there is a benefit to having an on-camera host (i.e., the stand-up condition) versus just hearing their voiceover (i.e., the original video condition) in terms of audience engagement. Prior research suggests that viewers engage more (e.g., subscriptions, likes) with female-hosted science channels than with video narrated without a host appearance (Amarasekara & Grant, 2019). Here, we did not find this difference. Our study found no main effect in engagement scores (or perceptions of authenticity) between the *Deep Look* episodes with a stand-up introduction and the voiced-over original episodes without the introduction by a host on screen. We suspect that because participants in this study watched only one episode and saw the host appear only one time on-camera for a short duration introducing the video (and not throughout the episode), the exposure time may not have been long enough to influence viewers' engagement or perceptions of authenticity relative to the original video. Also, because of budget limitations, our study design did not include manipulations in which participants saw the host at the beginning of the feature and the host featured in behind-the-scenes content.

Considerations

The target audience for high-quality, educational science media, such as KQED's *Deep Look*, is often people, regardless of gender. Yet, the public broadcasting organization observed a disparity between the proportion of male and female viewers. A prior study found that although women were much less likely than men to agree to watch an episode of the show, men and women who agreed to watch the show engaged with them to similar extents (Kahan, 2019). We can add that the inclusion of different types of behind-the-scenes content to the episodes also influences engagement but is conditional on gender and science curiosity. If a science media outlet like KQED wants to increase engagement among *women* using behind-the-scenes content, our findings suggest that content ought to be professionally produced.

It is also worth noting the differences between Kahan and colleagues' study and the one described here, as these differences may have resulted in differences in engagement outcomes. In Kahan (2019), participants selected whether to watch a standalone *Deep Look* episode or skip to the next part of the survey, and they could have clicked off the video at any point. Thus, the participants for which engagement was measured had all opted into watching the video. In this study, we set a timer that did not allow participants to advance to the next question until after the video was completed. We may have found differences in engagement where Kahan did not because we measured engagement among those who may *not* have watched the video if given a choice. Moreover, as we pointed out earlier, if women low in science curiosity had the choice to skip the video in our study, we likely would not have observed greater engagement among these individuals in the behind-the-scenes content conditions.

Also, we derived our conceptual definition and measure of authenticity from a combination of trust and credibility; however, some researchers propose that authenticity ought to be considered conceptually different from credibility and trust (Napoli et al., 2014). These conceptualizations of authenticity incorporate the dimensions of quality/craftsmanship, heritage, and sincerity (Napoli et al., 2014). Although craftsmanship, in particular, is important to producers of creative media, in our hypotheses, we were more interested in the dimensions of sincerity and the idea of transparency. We predicted that behind-the-scenes content increases transparency, thus improving audiences' perceptions that the content is believable.

Conclusion

Overall, the study results suggest that engagement with science videos requires made-to-order productions, depending on a science communicator's target audience. What produces a positive response among women may not have as great an impact on men of similar science curiosity. Likewise, what appeals to high science-curious individuals may disinterest those with a less science-curious disposition. The findings also highly the importance of considering dispositional variables when evaluating science media, particularly science curiosity.

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No potential conflict of interest was reported by the author(s).

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