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Representation in ScienceTok: Communicator Identities, Message Content, and User Engagement on a Short-Form Video Social Media Platform

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Given the popularity of short-form video platforms such as TikTok, particularly among young women and people of color, representations on these sites may shape beliefs about, identification with, and self-images as scientists. The present study builds on social cognitive theory and schema theory to examine communicator gender and race/ethnicity in TikTok science videos, testing for patterns across these identities in terms of disciplines, topics, features, and engagement. A content analysis of 134 videos from 30 widely followed English-language accounts found that men outnumbered women as communicators and that white communicators were more common than communicators of color. Relatively few associations emerged between communicator identities and disciplines, topics, or features, but videos with male communicators tended to receive higher engagement, a pattern not seen with women communicators. Taken together, these findings provide foundations for studying how TikTok videos may reinforce or counter long-standing demographic disparities in science.

Keywords: science, social media, short-form videos, representation, content analysis

Since the late 2010s, scientists and science communicators across various disciplines have increasingly used short-form video social media platforms such as TikTok, Instagram Reels, and YouTube Shorts to reach broader audiences (Hayes, Stott, Lamb, & Hurst, 2020; Radin & Light, 2022; Zawacki, Bohon, Johnson, & Charlevoix, 2022). Unlike traditional social media platforms such as Facebook or traditional video-sharing platforms such as YouTube, these platforms emphasize short videos and are known for featuring dance routines, memetic remixes, music, filters, and editing effects (Zeng, Schäfer, & Allgaier, 2020). Many science-related accounts have amassed large followings on TikTok in particular (Cummings, 2024; Wong, 2024).

The visibility of such accounts reflects the widespread popularity of short-form video platforms among the public. Four years after its global launch in 2017, TikTok reported more than a billion active users worldwide; in 2023, it announced 150 million active users in the United States alone (Shepardson, 2023). The platform is highly popular among young people, with two-thirds of U.S. teenagers reporting that they

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use it (Vogels & Gelles-Watnick, 2023). In response to TikTok's success, other platforms have added similar features: For example, Instagram introduced Reels in 2020, and YouTube made its Shorts feature available worldwide in 2021.

The growing prominence of science communication through short-form video platforms raises the prospect that messages on these platforms will influence public perceptions of science and scientists. A large body of research has shown that media portrayals can shape attitudes toward science and scientists (Dudo et al., 2011; Gerbner, Gross, Morgan, & Signorielli, 1981). Looking at online platforms in particular, previous research has found that messages on social media sites such as Facebook and Instagram and video-sharing sites such as YouTube can influence a range of beliefs and opinions about science, including perceptions of scientists (Brewer & Ley, 2021; Jarreau, Dahmen, & Jones, 2019; Vraga & Bode, 2017). Thus, it is important to understand what sorts of science communication occur on short-form video social media platforms (Keng & Cheng, 2023; Nguyen & Diederich, 2023). To date, a small body of research has addressed this question; for example, recent studies of TikTok have analyzed the content of science meme videos (Zeng et al., 2020) as well as engagement with different styles of educational science videos (Habibi & Salim, 2021).

Yet, research on how social media can reinforce—or, alternatively, challenge—long-standing demographic disparities in science and science communication (Brewer & Ley, 2017; Jarreau, Dahmen, & Jones, 2019; Ke, Ahn, & Sugimoto, 2017; Welbourne & Grant, 2016) suggests that it is also important to explore *who* communicates about science on short-form video social media platforms. TikTok is especially popular among teenage girls and teens of color (Vogels & Gelles-Watnick, 2023), making it a potentially powerful medium for speaking to young people from groups that have historically been and continue to be underrepresented in science (see National Science Board, 2022). Furthermore, research building on social cognitive theory (Bandura, 1989) and schema theory (Bem, 1981) suggests that media representations can influence young audience members' stereotypes of, identification with, and possible selves as scientists—all of which, in turn, can shape the pursuit of scientific education and careers (Cheryan, Master, & Meltzoff, 2015; Cheryan, Plaut, Handron, & Hudson, 2013; Long et al., 2010; Steinke & Duncan, 2023; Steinke et al., 2009). Thus, diverse representations of scientists on social media platforms may provide young people—particularly women and people of color—with influential role models who challenge common stereotypes of science (Phillips, Walsh, Grayson, Penney, & Husain, 2022; Steinke, Coletti, & Gilbert, 2024; Steinke, Gilbert, et al., 2024).

Highlighting the potential for TikTok to promote the visibility of women scientists and foster inclusivity in science communication, recent studies have demonstrated how women scientists on TikTok are using the platform to present their work and counter gender stereotypes of science (Huber & Baena, 2023) and STEM more broadly (Steinke, Gilbert, et al., 2024). However, these studies focused on content created by women scientists; accordingly, they did not seek to explore patterns across communicator gender in science-themed TikTok videos. Similarly, previous research has paid relatively little attention to potential disparities across race and ethnicity in terms of who communicates about science on the platform or to potential differences in message content and engagement across communicator identities.

With this in mind, the present study examines representations of science in TikTok videos, drawing on theoretical accounts grounded in schema theory and social cognitive theory (Steinke, 1998; Steinke &

Duncan, 2023; Steinke et al., 2009). In terms of communicators, the study considers whether findings of demographic disparities in science communication on other social media platforms (Ke et al., 2017; Welbourne & Grant, 2016) carry over to TikTok despite its popularity among women and people of color. The study also builds on previous research by examining what disciplines, topics, and features TikTok science videos include (Huber & Baena, 2023; Steinke, Gilbert, et al., 2024; Zeng et al., 2020), as well as whether these content factors vary across communicator identities in ways that echo or counter broader media stereotypes of science (Cheryan et al., 2015, 2013; Steinke & Taverez, 2017). Additionally, the present study examines whether patterns across communicator identities in engagement with TikTok science videos replicate engagement patterns on other platforms (Amarasekara & Grant, 2019). To these ends, the study analyzes videos from 30 widely followed—and, thus, highly visible (see Welbourne & Grant, 2016)—TikTok accounts featuring English-language science content.

Representations of Science and Role Models on TikTok

The scientific community has a long record of exclusion based on gender, race, and ethnicity (Malcom, Hall, & Brown, 1976; Ong, Wright, Espinosa, & Orfield, 2011). In the United States, for example, women and people of color have historically been underrepresented in scientific occupations, and this pattern has continued to the present despite shifts toward greater equity (National Science Board, 2022). Furthermore, media messages often reproduce these disparities. For example, popular television programs (Dudo et al., 2011) and films (Steinke & Tavarez, 2017) have tended to under-represent women and people of color as scientists. Nor are social media platforms immune from such patterns, particularly given the identity-based harassment that women science communicators and science communicators of color often experience on these platforms (Amarasekara & Grant, 2019; Brewer & Ley, 2017; You, 2014). For example, studies have found that women scientists are underrepresented compared to men on Twitter/X (Ke et al., 2017) and as hosts of science YouTube channels (Brewer & Ley, 2021; Welbourne & Grant, 2016).

Research drawing on social cognitive theory and schema theory highlights how such disparities may have consequences for viewers' beliefs about science and, ultimately, their pursuit of scientific education and careers (Steinke, Applegate, Lapinski, Ryan, & Long, 2012; Steinke et al., 2009). Building on social cognitive theory's account of socialization through modeling (Bandura, 1989), Steinke and her colleagues have argued that young people may base their aspirations regarding science on media models of scientists (Steinke, 2005; Steinke & Duncan, 2023). Specifically, exposure to these models can influence whether young audience members develop wishful identification with scientists (Steinke et al., 2012) and form possible selves as scientists (Steinke et al., 2009). Complementary research drawing from schema theory's conceptualization of mental structures organized around social categories such as gender (Bem, 1981) has also highlighted how exposure to media portrayals can influence young people's stereotypes of scientists (Steinke, 1997; Steinke & Duncan, 2023; see also Bond, 2016). Thus, demographic disparities among scientists on social media and video-sharing platforms may reinforce the underrepresentation of women and people of color in science.

At the same time, women scientists and scientists of color have used these platforms to counter stereotypes and challenge sexism and racism in science. For example, the Women Doing Science project has used Instagram to highlight women scientists with diverse racial and national identities (Phillips et al.,

2022). Research also suggests that such efforts can shape audience members' beliefs. One study found that exposure to a YouTube video challenging sexism in science increased perceptions of gender bias in science while simultaneously promoting more favorable attitudes toward science (Brewer & Ley, 2017), and another study found that seeing selfies of women scientists on Instagram decreased gender stereotypes of science (Jarreau, Dahmen, & Jones, 2019).

TikTok's popularity among young people makes it a highly visible medium for providing representations and potential role models of scientists. In particular, its popularity with young women and people of color could make it a powerful platform for encouraging—or discouraging—members of these historically underrepresented groups to identify with scientists and develop self-images as possible scientists. Recent research indicates that many women scholars have used the platform to counter gender stereotypes of science (Huber & Baena, 2023) and STEM more broadly (Steinke, Gilbert, et al., 2024), yet the barriers reinforcing demographic disparities in science communication on Twitter/X and YouTube could extend to TikTok, as well. With this in mind, the present study addresses the following questions:

RQ1A: How do TikTok science videos represent scientists in terms of gender?

RQ1B: How do TikTok science videos represent scientists in terms of race and ethnicity?

Disciplines and Topics in TikTok Science Videos

Just as it is important to understand how TikTok videos represent scientists in terms of demographic identities, it is also important to explore how these identities may intersect with representations of different scientific disciplines and topics. In terms of overall disciplinary prominence, some previous research suggests that physical sciences are the most commonly depicted fields in social media science videos: For example, an analysis of videos from the top YouTube science channels found that physics and astronomy were the most frequently depicted disciplines (Brewer & Ley, 2021), and an analysis of TikTok science meme videos found that physics and chemistry were the most frequently portrayed fields (Zeng et al., 2020). One study looking specifically at TikTok accounts of women science communicators found that creators from the natural sciences outnumbered those from the social sciences (Huber & Baena, 2023), while a study of TikTok videos posted by women in STEM found that computer science/technology, astronomy, and biology were the most frequently represented fields (Steinke, Gilbert, et al., 2024). To extend this line of research, the present study asks the following question:

RQ2A: What disciplines do TikTok science videos represent?

Looking beneath the overall distribution of disciplines, another important question is whether TikTok videos tend to reinforce socially constructed associations between gender and specific fields of study. The extent of the "gender gap" in science varies substantially across STEM disciplines: In the United States, for example, the ratio between women and men is much more balanced in life science and social science occupations than in physical science or engineering occupations (National Science Board, 2018). Moreover, previous research has shown that messages in media such as television (Geena Davis Institute, 2018) and film (Steinke & Tavarez, 2017) tend to associate men with physical sciences and engineering and women

with life sciences and that exposure to discipline-specific gender stereotypes in media messages can influence career interests among young women (Cheryan et al., 2015, 2013). With these patterns in mind, the present study asks the following question:

RQ2B: Is communicator gender associated with disciplines in TikTok science videos?

Previous research has also considered the topics of social media messages about science. A study of Facebook posts identified four broad topic categories: explanations or demonstrations of concepts, new discoveries, "news you can use" in the form of tips or advice, and self-promotion (Hitlin & Olmstead, 2018). Subsequent research on short-form social media videos has highlighted the prevalence of the first category; in particular, Zeng et al.'s (2020) study of TikTok meme videos found that "science in the making" (such as do-it-yourself experiments) and presentations of explanations or facts appeared in more than three-fourths of the videos sampled (p. 3218). Building on this research, the present study asks:

RQ2C: What topics do TikTok science videos address?

Huber and Baena's (2023) analysis of TikTok videos posted by women scientists raises the additional possibility that topics may be associated with communicator gender. This study found that 40% of the videos analyzed focused on explanations and demonstrations—still a sizable proportion, but around half the percentage observed by Zeng et al. (2020). Meanwhile, another 13% of the videos Huber and Baena (2023) analyzed offered expert advice or opinion. However, to date, no research has directly tested whether TikTok videos represent men and women differently as explainers and demonstrators of science—or, alternatively, as advice-givers, self-promoters, or reporters of new discoveries. Thus, the present study asks the following question:

RQ2D: Is communicator gender associated with topics in TikTok science videos?

Platform Features and TikTok Science Videos

Beyond content related to disciplines and topics, research on social media has observed that each platform provides unique features through which content creators can engage and potentially influence audiences (Steinke, Gilbert, et al., 2024; Zeng et al., 2020). For example, Instagram facilitates the sharing of hashtags and "selfies" (Jarreau, Cancellare, et al., 2019; Steinke, Coletti, & Gilbert, 2024). Reflecting these combinations of features, each platform also possesses its own distinct sets of affordances—that is, "things that it allows and makes easy versus things that are not possible or difficult" (Tufekci, 2014, pp. 506–507; see also Treem & Leonardi, 2013). Consider Instagram: on this platform, science content creators can use hashtags to present identities as women scientists (Steinke, Coletti, & Gilbert, 2024) and post selfies to counter gender stereotypes of science (Jarreau, Cancellare, et al., 2019). More broadly, social media platform features can contribute to affordances for audience engagement with science (Ley & Brewer, 2018; Steinke, Gilbert, et al., 2024).

Like other social media platforms, short-form video platforms provide users with unique sets of features. In the case at hand, TikTok offers content creators opportunities to use visual, audio, and textual

features, including hashtags, music, and on-screen text (Hayes et al., 2020; Radin & Light, 2022; Zawacki et al., 2022; Zeng et al., 2020). Given that engagement with and responses to TikTok science may depend on the use of such platform features (Jarreau, Cancellare, et al., 2019; Steinke, Gilbert, et al., 2024), the present study addresses the following question:

RQ3A: What features appear in TikTok science videos?

Extending this logic, patterns across communicator identities in the uses of platform features could also carry implications for engagement with and responses to TikTok science videos. Looking at a sample of videos created by women in STEM, one study concluded that a majority of the videos featured text commentary over video or images; similarly, a majority featured music (Steinke, Gilbert, et al., 2024). Building on these findings, as well as research identifying hashtags as potentially important tools for creating links between communicator identities and science (Steinke, Coletti, & Gilbert, 2024), the present study asks the following question:

RQ3B: Is communicator gender related to features in TikTok science videos?

User Engagement With TikTok Science Videos

Given that media effects can ultimately depend on audience engagement (Welbourne & Grant, 2016), scholars have investigated how various communicator and content factors are related to engagement with science communication on social media platforms (Habibi & Salim, 2021; Su et al., 2021). Looking at science YouTube channels, one study found that videos with regular hosts received more views than videos without hosts, while communicator gender was marginally related to views (Welbourne & Grant, 2016). A subsequent study of this platform found that videos featuring women as hosts on science channels received particularly high numbers of likes, dislikes, and comments per view (Amarasekara & Grant, 2019).

Shifting focus to the platform at hand, a recent analysis of TikTok videos posted by women in STEM found that several platform features were associated with likes, comments, and/or shares (Steinke, Gilbert, et al., 2024). These forms of engagement have different implications: Liking requires the least cognitive effort, while sharing and commenting require more cognitive effort and greater self-presentation (Steinke, Gilbert, et al., 2024; see also Habibi & Salim, 2021). Extending previous research, the present study investigated what messenger and message factors are related to engagement with TikTok science videos, as captured by all four metrics available on the platform: likes, saves, shares, and comments. Such relationships could carry implications for the effects of representations in TikTok science; for example, differences in user engagement across communicator demographics could work to counter—or exacerbate—any "visibility gaps" in representation across these characteristics. Thus, the present study asks:

RQ4: Does engagement with TikTok science videos differ depending on (a) communicator gender, (b) communicator race and ethnicity, (c) disciplines, (d) topics, and (e) features?

Methods

The data for addressing the study's research questions came from a content analysis of videos posted on English-language science-related TikTok accounts from January 1 to March 31, 2023. To sample relevant cases, the present study used an account-based approach modeled after previous research (Huber & Baena, 2023; Steinke, Gilbert, et al., 2024). Specifically, the authors used two newly created accounts to search account names and profiles for science-related terms (e.g., "science," "astronomy," "biology," "chemistry," "geology," "meteorology," and "physics"). The authors also searched for accounts associated with top science-related accounts on other platforms (Brewer & Ley, 2021; Hitlin & Olmstead, 2018).

Building on previous studies of science communication on other social media platforms (Amarasekara & Grant, 2019; Brewer & Ley, 2021; Hitlin & Olmstead, 2018), the study focused on widely followed accounts to capture content from creators reaching—and, thus, potentially influencing—relatively large audiences (Welbourne & Grant, 2016). With this in mind, accounts were included in the sample only if they had at least 500,000 followers. Thus, the study's design emphasized analyzing particularly prominent accounts at the potential cost of not capturing patterns across the larger body of less-followed accounts, which could include more diverse representations (see Huber & Baena, 2023; Steinke, Gilbert, et al., 2024). The study also focused on content in English given that the coders primarily spoke this language; as a result, the design did not capture content in other languages. The discussion section revisits the implications of these choices for the generalizability of the findings.

In drawing the sample, the researchers selected accounts that regularly posted about scientific topics and had posted at least one video in the first three months of 2023. Thus, the analysis excluded accounts that posted content only tangentially related to science. The search process yielded 30 accounts, which collectively had almost 100 million followers and posted more than 1,000 videos during the period under study (see Table 1).[1] Previous human content analyses of science videos on social media platforms have sampled anywhere from 30 to 100 accounts: Brewer and Ley (2021) analyzed 30 YouTube channels, Huber and Baena (2023) analyzed 50 TikTok accounts, Steinke, Gilbert, et al. (2024) analyzed 100 TikTok accounts, and Welbourne and Grant (2016) analyzed 39 YouTube channels. The present study's sample fell on the low end of this range, suggesting the need for additional caution in generalizing its results.

Table 1. Overview of Science-Related TikTok Accounts Included in the Analysis (January–March 2023).

	Minimum	Maximum	Mean	Median	Total
Followers	557,000	10,700,000	3,326,093	1,900,000	99,782,800
Videos	1	131	36	30	1,089

Note. $N = 30$

To obtain a sample for analysis, the authors randomly selected 5 videos from each of the 30 accounts. This approach reflects strategies in previous analyses of science videos using account-based

[1] The full list of accounts is available at https://osf.io/mk8ej/files/osfstorage/679bc4cded16ba2c7744609c

sampling and human coding: For example, Brewer and Ley (2021) sampled 5 videos per YouTube channel, Huber and Banea (2023) selected 3 videos per TikTok account, and Welbourne and Grant (2016) sampled 10 videos per YouTube channel. Four accounts sampled for the present study posted fewer than five videos during the period under study; for these accounts, all videos from the period were selected.

Two of the selected videos were deleted from TikTok during the coding process and, thus, were dropped from the analysis, leaving a final sample of 134 videos. Given that previous human content analyses of science videos on social media platforms sampled 391 (Welbourne & Grant, 2016), 150 (Brewer & Ley, 2021), 40 (Habibi & Salim, 2021), 200 (Zeng et al., 2020), 150 (Huber & Baena, 2023), and 400 (Steinke, Gilbert, et al., 2024) videos, the present study's sample fell toward the lower end of the typical range for such research, warranting additional caution.

Coding

Communicators

The analysis captured whether each video featured a human communicator speaking on screen or in a voice-over (excluding background music) and whether it featured a human communicator's face on screen. Each video featuring a human voice was coded for the presence of a *woman*, *man*, or *nonbinary* communicator. Videos featuring a human on screen were also coded for whether they included an *Asian* communicator, a *Black* communicator, a *Hispanic/Latino* communicator, a *Middle Eastern/North African* communicator, a *Native American* communicator, a *White* communicator, and/or a communicator specifically identified as *multiracial*. Communicator demographics were coded based on account descriptions (when available) and/or inferred from the video presentation, relying on expectations situated in societal constructions of these categories (while recognizing the challenges involved in researcher attribution of demographics; see Lindqvist, Sendén, & Renström, 2021).

Disciplines

The coding scheme for disciplines drew on previous analyses of TikTok science videos (Huber & Baena, 2023; Steinke, Gilbert, et al., 2024; Zeng et al., 2020) and captured categories that both media messages and members of the public have historically associated with men (physical sciences; engineering and technology) or women (life sciences) (Cheryan et al., 2015, 2013). The categories used were *physical sciences* (including astronomy, chemistry, and physics), *earth sciences* (including geology, oceanography, meteorology, climatology, and environmental sciences), *life sciences* (including biology, forensic science, health, medicine, nutrition, neuroscience, and paleontology), *behavioral sciences* (including psychology, sociology, economics, and political science), and *engineering/technology* (including artificial intelligence, computer science, and robotics). Each video could include multiple disciplines (or none).

Topics

The coding scheme captured the presence of four topics or content categories drawn from previous research (Hitlin & Olmstead, 2018; Huber & Baena, 2023; Zeng et al., 2020). Videos on *new discovery*

topics highlighted recent scientific findings, such as the discovery of previously unknown information about astronomical objects, geological features, species, subatomic particles, or other natural phenomena. Videos with *explanation/demonstration of concepts* explained or illustrated a scientific phenomenon, such as a chemical reaction or biological process. Video with *news you can use* topics provided viewers with practical advice, tips, or recommendations about something related to science—for example, advice about personal health or nutrition or tips on how to protect the environment or reduce climate change. Lastly, videos with *promotion* topics advertised a media program, speech, public appearance, event, book, or product. Each video could include multiple topics (or no topic).

Features

The coding scheme captured the presence or absence of three platform features highlighted by previous research (Steinke, Coletti, & Gilbert, 2024; Steinke, Gilbert, et al., 2024): *hashtags*, *music* (including background instrumental music), and *text on screen* (including any words superimposed on the video but not autogenerated captions or video descriptions). The coding scheme also included a measure for the use of visual effects such as animations, filters, graphics, or green screens; given that the coding for this variable was not sufficiently reliable, however (see below for details; Gwet's AC = .45; percentage agreement = 72%), it was dropped from the analysis.

Engagement

The analysis captured three metrics examined in previous research on TikTok science videos—likes, shares, and comments (Steinke, Gilbert, et al., 2024)—along with a fourth metric, saves. Following previous research (Steinke, Gilbert, et al., 2024), each metric was examined separately.

Intercoder Reliability

Each video in the sample was coded by two trained undergraduate student coders. For each variable, intercoder reliability was assessed by calculating the simple percentage of agreement between coders and a chance-corrected measure of agreement (Gwet's AC, a measure appropriate for variables with high or low trait prevalence; Gwet, 2008). Intercoder reliability was good to excellent (agreement ≥ 80%; Gwet's AC ≥ .75) for all variables reported below except three (see Tables 2–5): the presence of a physical sciences discipline, the presence of a life sciences discipline, and the presence of an explanation/demonstration of concepts topic. Given the lower reliabilities for these three variables (agreement ≥ 75% but < 80%; Gwet's AC ≥ .50 but < .75), results for them should be interpreted with caution. A third coder resolved all disagreements between the first and second coders.

Results

The content analysis findings for communicators, disciplines, topics, and features are presented in Tables 2–5. Chi-square tests examined how these variables were related to one another, and independent samples t-tests examined how they were related to engagement metrics.

Communicators

In the sample, 86% of the videos featured a human communicator's voice, either as a voice-over or direct address, and 72% featured a human communicator's face on screen. In terms of communicator gender (RQ1A), around two-thirds (66%) of videos included a man as a communicator (e.g., Hank Green, Bill Nye, Neil deGrasse Tyson, and Phillip Cook), whereas only a fifth (19%) included a woman as a communicator (e.g., Nancy Bullard, Alexandra Doten, and Chemical Kim). In short, the analysis revealed a sizable gender gap in who communicated on widely followed English-language science-themed TikTok accounts. Meanwhile, no video in the sample featured a communicator specifically identified as nonbinary.

Table 2. Communicators in TikTok Science Videos.

	Frequency		**Reliability**	
Communicator	Count	Percentage	Gwet's AC	% Agreement
Human voice	115	86%	.92	94%
Human face	96	72%	.90	96%
Man	89	66%	.85	91%
Woman	25	19%	.89	93%
Asian	3	2%	.94	95%
Black	6	5%	.98	99%
Hispanic/Latino	0	0%	.96	96%
Middle Eastern/North African	10	8%	.93	93%
Native American	0	0%	.99	99%
White	82	61%	.77	88%
Multiracial	3	2%	.93	93%
N	134			

Note. Videos could include more than one communicator.

Looking at communicator race and ethnicity (RQ1B), 61% of the videos featured a white communicator (e.g., Green, Nye, Cook, Bullard, and Doten). Far fewer videos featured a Middle Eastern or North African communicator (8%; e.g., Hashem Al-Ghaili) or a Black communicator (5%; e.g., Tyson). Only 2% of the videos featured an Asian communicator, while the same percentage included a multiracial communicator. No video in the sample featured a Hispanic/Latino communicator or a Native American communicator. Just as the videos in the sample reflected broader gender disparities in science and science communication, they also mirrored the historical underrepresentation of people of color within these fields. Moreover, only three videos included women of color as communicators: two featured Asian women and one featured a Black woman.

Disciplines and Topics

In terms of disciplines (RQ2A), more than half the videos in the sample (54%) addressed physical sciences: for example, videos addressed rocket fuel, bubbles, salt crystals, and comets. Life science disciplines were the second most common, appearing in 37% of videos, such as those about mushrooms, anatomical dissections, narwhals, and water allergies. Relatively few videos addressed engineering and technology (9%; e.g., Tesla coils and race car inspections), earth sciences (8%; e.g., the land bridge between Asia and North America), or behavioral sciences (7%; e.g., poll results). Put simply, the videos analyzed emphasized physical and life sciences over other disciplines.

Turning to differences across communicator gender in disciplines represented (RQ2B), a series of chi-square tests revealed that videos featuring women communicators were particularly likely to include earth sciences, $X^2(1, 134) = 7.00$, $p < .01$. However, no other significant associations emerged between the presence of a woman communicator and specific disciplines. Nor was the presence of any discipline significantly related to whether the videos included men as communicators. Of particular interest, the tests yielded no evidence that the videos collectively reinforced stereotypes associating physical sciences with men and life sciences with women.

Table 3. Disciplines in TikTok Science Videos.

	Frequency		**Reliability**	
Topic	Count	Percentage	Gwet's AC	% Agreement
Physical sciences	72	54%	.54	77%
Life sciences	49	37%	.59	78%
Engineering/technology	12	9%	.88	90%
Earth sciences	10	8%	.75	81%
Behavioral sciences	9	7%	.89	90%
N	134			

Note. Videos could include more than one discipline.

Of the topic categories captured in the analysis (RQ2C), the most common was the explanation/demonstration of concepts category, which appeared in almost three-fourths of all videos (72%). For example, videos in the sample featured explanations and/or demonstrations of reactions between acids and bases, the chemistry of Pop Rocks, and the effects of niacinamide. By comparison, the new discovery category was much less common (13%); instances included videos about water worlds and the world's oldest hedgehog. A roughly similar proportion of videos (12%) promoted speaking engagements, festivals, online educational programs, or other endeavors. Only 5% of videos included "news you can use"; here, examples included videos that gave advice on how to avoid brain-eating amoebas or information on the lack of research behind acne face maps. Thus, the findings indicated that most videos focused on explanations and demonstrations.

Another series of chi-square tests addressed potential associations between communicator gender and topics (RQ2D). These tests revealed that videos featuring women communicators were

particularly likely to include new discoveries, $X^2(1, 134) = 5.61$, $p < .05$, and "news you can use," $X^2(1, 134) = 4.07$, $p < .05$. No other significant associations emerged between the presence of a woman communicator and specific topics, nor was the presence of any topic significantly related to whether the videos included men as communicators.

Table 4. Topics in TikTok Science Videos.

	Frequency		**Reliability**	
Topic	Count	Percentage	Gwet's AC	% Agreement
Explanation/demonstration of concepts	97	72%	.62	77%
New discovery	18	13%	.87	90%
Promotion/ad	16	12%	.86	88%
News you can use/tips	6	5%	.88	90%
N	134			

Note. Videos could include more than one topic.

Features

In regard to uses of TikTok's platform features (RQ3A), the analysis found that an overwhelming majority of videos (90%) in the sample included hashtags such as #sciencetok, #spacetok, #learnontiktok, and #sciencerules. Another common feature was the use of text on screen (77%). Around half the videos (48%) featured music; for example, videos included songs by singer-songwriter Ellen Once Again and rock band Rainbow Kitten Surprise. Communicator gender was not significantly associated with the use of hashtags, text on screen, or music (RQ3B). Instead, both women and men tended to use these features in communicating science.

Table 5. Features in TikTok Science Videos.

	Frequency		**Reliability**	
Feature	Count	Percentage	Gwet's AC	% Agreement
Hashtag	121	90%	.96	97%
Text on screen	103	77%	.75	94%
Music	64	48%	.84	97%
N	134			

Note. Videos could include more than one feature.

Engagement

Likes were the most common form of engagement with the videos in the sample (mean = 191,942; median = 13,000), followed by saves (mean = 12,281; median = 760), shares (mean = 8,880; median = 340), and comments (mean = 1,270; median = 168). The means for these measures were skewed by a few videos with very high engagement—most notably, a Bill Nye video with 7,400,000 likes, 382,100 saves, 549,000 shares, and 40,100 comments. Given the skewed nature of the engagement measures, the study's analysis of factors associated with them (RQ4A–E) focused on their natural logs (which had more normal

distributions; see also Welbourne & Grant, 2016). A series of independent samples t-tests showed that videos with human voices received more likes, $t(132) = 2.36$, $p < .05$, comments, $t(132) = 2.15$, $p < .05$, and saves, $t(132) = 2.73$, $p < .05$, than videos without such voices. These tests also revealed that videos with men as communicators received more likes, $t(132) = 2.63$, $p < .05$, comments, $t(132) = 2.37$, $p < .05$, and saves, $t(132) = 2.54$, $p < .05$, than videos without such communicators; meanwhile, engagement did not differ depending on whether videos included women communicators. Put another way, male science communicators received an engagement premium that did not extend to women.

With one exception, communicator race and ethnicity appeared to matter relatively little for engagement with the videos in the sample. Videos with Black communicators received more comments than other videos, $t(132) = 3.04$, $p < .05$, but did not differ significantly on other engagement metrics. Nor did any of these metrics differ across other variables capturing communicator race and ethnicity. However, these results should be interpreted with caution given that relatively few videos included communicators of color.

In terms of content characteristics, videos about life science disciplines received fewer saves, $t(132) = 2.06$, $p < .05$, than videos that did not represent these disciplines. Additionally, videos with "news you can use" topics received fewer likes, $t(132) = 5.79$, $p < .01$, comments, $t(132) = 2.92$, $p < .05$, saves $t(132) = 3.88$, $p < .01$, and shares $t(132) = 2.52$, $p < .05$, than videos without such topics. No other significant differences in the engagement variables emerged across disciplines or topics, nor did any engagement metrics differ depending on the presence of hashtags, text on screen, or music in videos.

Discussion

Extending previous research on the use of TikTok in science communication (Habibi & Salim, 2021; Huber & Baena, 2023; Steinke, Gilbert, et al., 2024; Zeng et al., 2020), this study examined representations of science in TikTok videos from widely followed English-language science-themed accounts. Specifically, it analyzed how such videos represented communicator gender and communicator race and ethnicity, as well as how these representations intersected with disciplines, topics, platform features, and user engagement. In terms of *who* communicates about science on highly visible accounts, the results revealed a gender gap similar to those observed in science communication on Twitter/X (Ke et al., 2017) and YouTube (Brewer & Ley, 2021; Welbourne & Grant, 2016). Notably, this pattern emerged despite the efforts of many women scholars and STEM communicators on TikTok (Huber & Baena, 2023; Steinke, Gilbert, et al., 2024) and the greater popularity of TikTok among women and girls than among men and boys (Auxier & Anderson, 2021; Vogels & Gelles-Watnick, 2023). Similarly, communicators of color were heavily outnumbered by white communicators, despite the greater popularity of TikTok among Black and Hispanic users than among white users (Auxier & Anderson, 2021; Vogels & Gelles-Watnick, 2023). The absence of women of color as communicators was particularly striking.

Previous accounts suggest several explanations for these results. In part, the patterns observed here may reflect ongoing disparities in science education and occupations (National Science Board, 2022). At the same time, they may reflect parallel disparities in science communication itself (Dudo et al., 2011; Steinke & Tavarez, 2017), including on other platforms (Brewer & Ley, 2017; Jarreau, Dahmen, & Jones,

2019; Ke at al., 2017; Welbourne & Grant, 2016). Some of the most popular accounts in the sample featured men with highly visible presences in traditional media and/or on other social media platforms—for example, Bill Nye, Hank Green, and Neil deGrasse Tyson—suggesting that broader gender gaps in media opportunities may carry over to TikTok. The sexism and harassment women science communicators experience on other social media platforms (Brewer & Ley, 2017; You, 2014) likely extend to TikTok, as well, which could serve to discourage women from creating science content on the platform. Similar dynamics could create barriers for science communicators of color on TikTok; furthermore, the invisibility of women of color on the platform may reflect the broader "double bind" of sexism and racism confronting women of color in science (Malcom et al., 1976; Ong et al., 2011).

As for the consequences of the disparities observed here, previous research drawing on social cognitive theory (Steinke, 2005; Steinke & Duncan, 2023) and schema theory (Steinke, 1997) points to how these patterns could buttress existing barriers to inclusivity in science. To be sure, young women and people of color can draw inspiration from science communicators who do not match their demographic characteristics (if not necessarily as strongly as from communicators who match such characteristics; see Steinke et al., 2012). Furthermore, exposure to messages that represent women as science communicators—as a fifth of the videos in our sample did—can challenge gender stereotypes of scientists (Bond, 2016; Brewer & Ley, 2017; Huber & Baena, 2023; Jarreau, Dahmen, & Jones, 2019) among young audiences in general while fostering wishful identification with scientists (Steinke et al., 2012) and possible selves as scientists (Steinke et al., 2009) among young women in particular. However, the overall gender balance in the sample suggests that exposure to widely followed English-language TikTok science accounts could reinforce gender stereotypes of science. Similarly, the relative invisibility of science communicators of color on such accounts could convey an unwelcoming message to young audience members of color.

One encouraging finding from the analysis of communicator demographics was that patterns in representations of communicator gender and disciplines did not appear to reinforce stereotypes associating women with life sciences and men with physical sciences or engineering (see Cheryan et al., 2015, 2013; Geena Davis Institute, 2018). Thus, exposure to highly visible English-language TikTok science accounts could help to counter this specific set of gender stereotypes. Such exposure could also encourage young women to identify with and see themselves as earth scientists given the finding of an association between the presence of a women communicator and earth science disciplines.

Looking more broadly at the results for the content variables, the analysis showed that the videos analyzed tended to emphasize physical sciences such as astronomy, chemistry, and physics (for a similar result, see Zeng et al., 2020). Meanwhile, the most common types of topics within the videos sampled were explanations and demonstrations of concepts—a result that dovetails with findings from other recent studies of TikTok (Huber & Baena, 2023; Zeng et al., 2020). These patterns suggest that the design and popular practices of TikTok encourage the creation of videos illustrating principles in disciplines such as physics, chemistry, and astronomy. As a result, the platform may give its young-skewing audience an image of science that emphasizes some fields over others—with potential implications, in turn, for users' interest in and pursuit of scientific education and careers (see also Zeng et al., 2020).

Regarding platform features, the analysis revealed that the videos in the sample frequently used hashtags, text on screen, and music. Given that specific social media features may carry implications for engagement and audience responses (Jarreau, Cancellare, et al., 2019; Ley & Brewer, 2018; Steinke, Coletti, & Gilbert, 2024; Steinke, Gilbert, et al., 2024), the present study's findings provide starting points for investigating their potential effects in the context of TikTok science. For example, future research could examine whether the use of hashtags, text, and music moderates the impact of exposure to TikTok science videos on attitudes and perceptions, and whether message processing variables, such as attention and retention, mediate these relationships.

Extending previous research on factors linked to engagement with science communication on TikTok (Habibi & Salim, 2021; Steinke, Gilbert, et al., 2024), the analysis indicated that multiple factors were associated with such engagement. In terms of messenger factors, the most consistent result (across three metrics) was that videos that included men as communicators received relatively high engagement—a pattern that could exacerbate the gender gap in science communication on the platform. Not only did the videos in the sample include more men than women, but the ones that included men also stood out in terms of engagement, which may reflect structural factors such as resource gaps and algorithmic biases along with audience-level factors such as gender biases and stereotypes (Amarasekara & Grant, 2019; Welbourne & Grant, 2016). In terms of message factors, TikTok videos with "news you can use" topics received relatively low scores across all four engagement metrics, suggesting that they may resonate less than other topics on the platform. The same pattern may also contribute to and/or reflect the absence of an "engagement premium" for women communicators given that "news you can use" topics were associated with the presence of such communicators.

Limitations

In weighing the present study's conclusions, it is important to note several limitations of its design. First, the generalizability of the findings is limited by the sampling strategy used. Given the analysis's focus on widely followed accounts, its results may not be representative of the broader population of accounts. Outside the subset of accounts analyzed here, many women scholars and STEM communicators have used the platform to post about their work (Huber & Baena, 2023; Steinke, Gilbert, et al., 2024). Furthermore, the most-followed accounts overall may not necessarily be the most-followed accounts among young members of groups historically underrepresented in STEM. Thus, future research could analyze a broader range of accounts, including ones with fewer followers, and videos in languages other than English.

Second, this study's findings are limited by challenges in coding variables such as communicator demographics, content categories, and platform features, as well as by the coding scheme's exclusion of other potential variables. Given that the present study's attempt to code for visual effects did not yield reliable results, future research could develop a more nuanced coding scheme that captures multiple types of such effects. Additionally, future research could code for other variables, such as content creator type (e.g., celebrity, influencer, media, or teacher).

Third, the present study focused on only one short-form video platform: TikTok. With this in mind, future research could extend the present study's approach to platforms such as Instagram Reels and YouTube Shorts.

Future Directions

Considering these caveats, the present study's findings provide a foundation for future research on science communication through TikTok. One potential approach would be to build on the results presented here along with previous studies of social media message effects (Brewer & Ley, 2017, 2021; Jarreau, Cancellare, et al., 2019) to conduct experimental tests of how exposure to TikTok videos with different types of communicators, disciplines, topics, and features influences attitudes toward science and stereotypes of scientists. In addition, future studies could extend previous survey-based approaches (Huber, Barnidge, de Zúñiga, & Liu, 2019) to explore how patterns in the use of short-form video platforms are related to science attitudes and perceptions of scientists.

In terms of practice, the findings presented here highlight ongoing disparities—particularly in terms of gender and race/ethnicity—that future efforts at science communication through short-form video platforms could seek to remedy. In part, encouraging and supporting science communicators from underrepresented groups to use platforms such as TikTok may help narrow the demographic gaps observed in this study and, ultimately, contribute to a more inclusive image of science. By way of precedent, research looking at science communication on other social media and video-sharing platforms illustrates the potential of such an approach (Brewer & Ley, 2017; Jarreau, Cancellare, et al., 2019; Phillips et al., 2022). However, the barriers confronting women and people of color in science communication and science more broadly are both systemic and socially embedded (Amarasekara & Grant, 2019; Brewer & Ley, 2017, 2021; You, 2014). Thus, challenging these barriers on short-form video platforms may require not only individualistic approaches but also broader efforts by scientific institutions.

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