NEGOTIATING GENRE AND NEW MEDIA FOR STEM NEWS

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Data Availability Statement

We have uploaded prompts for journals, team discussions, exit interviews, and roundtables as supplementary materials. However, individual journals and transcripts of interviews and meetings are not available due to IRB restrictions on the sharing of raw data. Specifically, the power dynamics inherent in the composition of our team make this data sensitive: authors of this paper with direct supervisory authority saw only synthesized data from more junior members of their team, many of whom are also named as authors.

NEGOTIATING GENRE AND NEW MEDIA FOR STEM NEWS

This article – co-authored by a transdisciplinary team of social scientists and journalists in the United States – traces changes to the news landscape in recent decades, and asks: How are legacy media producers grappling with these new realities? As part of a four-year collaboration on young adult news consumption, we take a participatory action research approach to this question, tacking back and forth between newsroom concepts and anthropological ones in pursuit of a synthesis that strengthens both. Starting from anthropological frameworks of participation, the authors argue that broadcast videos typically position their audiences as overhearers rather than interlocutors, while the reverse is true for social media, and that these tendencies shape audience expectations. We find that many audiences have what we call poetic motivations: they are drawn to stories that exemplify their genre. For example, the participatory nature of social media genres translates well to a more candid style that can incorporate live questions and other direct participation. The study reported here focuses on STEM news, but many of the findings apply to news production in general. Our reflective methods can also be applied more widely in the field of journalism to synthesize perspectives from theory and practice.

KEYWORDS: journalism, new media, participation, engagement, participatory action research, science communication

Introduction

Today's young adults[1] have a different relationship to news than prior generations: rather than consuming news directly from a particular set of outlets at particular times, they receive much of their news through aggregators and social media, among other shifts. The major technological, legal, and social changes that have taken place during those young adults' formative years (Iyengar & Massey, 2018) have created the possibility of different ways of using news, and researchers have studied their consumption from a wide range of methodological and disciplinary perspectives (e.g. Bergström & Belfrage, 2018; Casero-Ripollés, 2012; Chan-Olmsted, Rim and Zerba, 2012; Huang, 2009; Hujanen and Pietikäinen, 2004; Lewis, 2008; Media Insight Project, 2015; Spitulnik Vidali, 2010; Westlund, 2015; Westlund & Färdigh, 2015). However, we cannot fully understand either news consumption or news production if we study the two practices in isolation (Deuze, 2007; Domingo, Masip, & Costera Meijer, 2015). After all, "people's expectations regarding what is news and who is entitled to produce it" both depend on and are shaped by "motivations and practices in the production of news" and "power relationships in the processes of the circulation of news" (Domingo, Masip, & Costera Meijer, 2015, p. 54).

This study traces some of those technological, legal and social changes, asking: How are legacy media organizations in the U.S. grappling with these new realities? We attempt to fill this gap through an approach not often applied to the study of journalism: participatory action research. Specifically, we present a case study of the STEM reporting team at a national broadcast media organization in the United States. The U.S. case may be particularly instructive because the country's media landscape is among the world's most polarized (Newman et al., 2018), and because many of the social media platforms that are most widely used globally were first developed in the U.S. for a U.S. audience.

News, STEM News, and Young Adults

We chose STEM news as the field of study due to its particular affordances. Specifically, science and STEM more broadly represent news topics that are covered in most major media outlets (Dunwoody 2008) but are not typically front-page news. Some researchers report that science journalism has entered a "golden age" (Hayden & Check Hayden 2018), producing "more and better journalism" in both specialized publications and more traditional outlets. While science journalism is increasingly the purview of freelancers (Hayden & Check Hayden, 2018), this paper's authors include a dedicated staff team of reporters and producers who focus on primary development of STEM content for their audiences, as well as an embedded transdisciplinary social science research team. Working together as participatory researchers, we used social science theories as a foundation to support, document, articulate, and query the relationships these journalists were developing with their audience and the affordances of social media technologies.

In the context of increasing study of U.S. young adults' media habits (e.g. Media Insight Project, 2015), STEM is particularly interesting because each generation is more interested than the previous one (Purcell et al., 2010). Furthermore, broadcast and web media are the main source of information about STEM topics for most adults who have finished their formal education (Falk & Dierking, 2010), and a growing number of adults get science news from social media (Funk, Gottfried, & Mitchell, 2017).

Theoretical Framework: Participation

While our team includes researchers from psychology, sociology, and anthropology, we take as our starting point an anthropological framework of participation that treats all communication as co-constructed rather than privileging any given party. Doing so helps us bridge the gap between two approaches to the study of journalism: journalism studies, which focuses on professional journalists and production, and cultural studies, which sees audiences as centrally agentive (Hartley, 2009).

The newsroom notions of *engagement* and *interactivity* map closely to this anthropological concept of *participation* (cf. Cotter, 2010). Considering these two concepts together makes clear the continuity between what we call "the media" and other kinds of communication (cf. Agha 2011), as well as between broadcast and social media news.

Linguistic anthropologists recognize that certain common-sense assumptions about communication are oversimplified, incomplete, and incorrect -- despite being widely held.[2] The field of linguistic anthropology counteracts these assumptions as follows (Table 1):

Table 1: Models of communication

Widely Assumed Model of Communication	**Linguistic Anthropology**
Communication is fundamentally dyadic, occurring between a speaker (or writer) and some audience.	Communicative events may be multi-directional, with **multiple parties** that play different types of roles.
Speaking (or writing) is inherently more active than listening (or reading), which is fundamentally passive.[i]	All communication is **co-constructed** and all parties in communication have agency to shape the message.
All speakers (writers) have equal access to all forms of speech -- appropriateness, correctness, and legitimacy are within the speaker's control.	We must always be mindful of questions of **power and hierarchy**. Judgments about speech are subject to structural conditions, including the speaker's identity and social position.

i. cf. Reddy, 1979

To unpack possible interactional roles beyond speaker and hearer, we talk about *participation frameworks* (or *participant structures*) (Goffman, 1979; Philips, 1972). Small-scale spoken communication requires participants to coincide in space and time, while mass media further complicate the picture by affording kinds of participation that are more far-flung kinds in both space and time (Gershon, 2017), such as Twitter, Facebook, chat room or a comment section on a news article. For example, Wasson (2006) considers the dual physical and social arrangement of participants in virtual meetings, Barchas-Lichtenstein (2013) outlines religious participation in a complex system of institutional written texts that circulate globally, and Newon (2014) explores participation and community in a multiplayer online game. Turning to news specifically, Cotter (2010) looks at participation in print journalism while Spitulnik Vidali (2010) considers new news media. Starting from this anthropological understanding of participation has several important implications for our understanding of mass media.

First, considering **multiple parties** shows us that journalists and media organizations play an active role in constructing news and newsworthiness. The news media do not simply transmit information between authorities and public audiences; rather, they mediate between these actors (see, e.g., Briggs, 2003). Journalists and media organizations determine what information is important to share, they select sources that they deem authoritative, and they make choices about how they share that information (cf. Cotter, 2010).[3] Their active participation becomes perhaps most obvious to the public when a journalist becomes associated with a specific story and finds themself not simply the teller of a story, but also a central part of that story. As Zelizer (1993, p. 28) observes of Bob Woodward and Carl Bernstein's role in Watergate, "By the mid 1970s, in some accounts the story of the journalistic coup began to displace the story of the nation's electoral and judicial processes." More recently, the Trump administration has used CNN's Chief White House Correspondent A. J. (Jim) Acosta as a target for their displeasure with journalism. Both of these examples illustrate that journalists are not mere relays but rather shape the stories they tell, even when they remain largely invisible to the public.

Second, recognizing **co-construction** acknowledges that media audiences are not passive consumers – and they never were. People discuss, circulate, and recontextualize media content all the time (e.g., Spitulnik, 1996; Media Insight Project, 2017), and scholars have long noted that ''much of the conversational grist for interpersonal dialogs is ground at the media mill'' (Miller, 1986, p. 132, cited in

Southwell and Torres, 2006). Online commentary renders some of that conversation more visible and allows it to circulate on a larger scale – indeed, choosing to read (or not read) the comments online is another form of active participation. However, online commentary remains just one element of a larger communicative economy in which people make sense of news stories. For example, one study of news talk on group messaging apps (Swart, Peters and Broersma, 2018) noted that many people preferred to use different media for accessing news and discussing it. Current digital-based research methods cannot easily capture conversations that move across platforms.

Third, structures of **power and hierarchy** explain why the advent of interactional media tools – including comment functions, blogs, chats, and other internet-enabled communications – did not automatically create more egalitarian information sharing. Social structures change slowly, and institutions retain much of their gatekeeping authority in the absence of transformative counterforces, as described in the following section.

Toggling between the newsroom concept of *engagement* and the anthropological concept of *participation* allows us to recognize the continuity between news created for different platforms, rather than seeing the move to digital as a radical break.

Background and History

New Media Expectations: Social Media and (the Promise of) Reciprocity

We cannot separate the content of what we communicate from its form. For example, research shows that the accent and dialect of a presenter affect our impression of them (see, e.g., Baugh 2015) – and thus of anything they say. Demographic traits influence our judgments of scientists' credibility (Zhu, Aquino and Vadera, 2016), and we may even accept claims more readily in certain text fonts than others (Diemand-Yauman, Oppenheimer and Vaughan, 2011; Song and Schwarz, 2008). So it should come as no surprise that similar content is presented differently across media, or that the public's expectations depend in part on the medium.

Marshall McLuhan's observation that "the medium is the message" (McLuhan, 1964) has become something of a cliché. There are also divergent interpretations of this statement, due in part to unstated assumptions about what we mean by *medium*. Does this term refer to the "material forms people use to communicate" (Gershon, 2010), the channel of communication, the person or persons communicating, or some combination of all three? For purposes of reporting this research, we define a *medium* as a system, technology, or tool that mediates communication, and we further agree that medium and message are inseparable. Consistent with others' work on the topic (e.g. Gershon, 2010; Gershon & Bell, 2013), we caution, however, that the reason for this inseparability has nothing to do with intrinsic characteristics of the form or technology. Instead, it is important to consider media ecologies, or "the interconnections between different media and the infrastructural decisions that shape these interconnections" (Gershon & Bell, 2013, p. 260), as well as media ideologies, or "how people on the ground understand how a medium's use affects messages" (Gershon & Bell, 2013, p. 260).

The advent of social media technology, otherwise called "new media," is a good example of the fallacy of technological determinism. New media seemed to promise the possibility of truly reciprocal exchange between journalists and audiences (Lewis, Holton, & Coddington, 2013), yet the reality has changed less slowly than the discourse would suggest. As Lasorsa, Lewis, and Holton (2012, p. 21) observe, journalists have typically sought to retain their gatekeeping authority by translating old practices to new media: "[T]he Internet was a new space mainly dominated by existing political actors and other

elites. It was politics as usual. In like manner, there was evidence to suggest that the political role of journalists had changed little during this first decade online." Based on content analysis of 22,438 tweets from 430 of the most followed journalists on Twitter over a two-week period, Lasorsa and colleagues found that, on Twitter, at least some journalists do deviate from their traditional role in at least three ways: they offer personal opinions, they share their gatekeeping role by retweeting others' content, and they provide accountability and transparency into the process of journalism by providing information about their jobs and entering into two-way discussion. Notably, those journalists employed by legacy papers and networks engage in these behaviors less than colleagues at less elite outlets. Lasorsa and colleagues suggest that journalists at these legacy outlets may have more investment in maintaining the traditional structures of journalistic authority. Similarly, research from a decade ago suggests that audiences on the internet continue to rely heavily on legacy news organizations (Dunwoody, 2008). This trend appears to persist: in one recent case study of a single topic, a full three-quarters of links in tweets were found to originate from news organizations (Stocking, Barthel and Grieco, 2018), and most of these were from legacy organizations.[4] Combined, these data suggest that the democratization promised by social media is mediated by existing institutions and hierarchies.

Developing New Media in the Public Eye: Interactivity and Immediacy

While mainstream news organizations have largely retained their authority, the ease of multidirectional social media communication **has** set new expectations for dialogic communication: news consumers are increasingly able to "actively contribute, criticize, or change news stories*"* (Karlsson, 2011, p. 285). In parallel, the availability of on-demand information has led to larger expectations of expedience. The valuing of immediacy has, of necessity, increased reliance on tentative information. This development in turn has created greater concern among formal newsroom staff, where editors have traditionally exercised careful management of source data verification and control over reporters' claims. The unending "Breaking News!" header has created a false sense of urgency in news production, independent of the actual pace required to grasp a story's complexity or known cause and effect. Today, the public expects to be involved earlier in the process: they expect news stories to develop and be revised in the public eye.

These technological shifts have spawned competing strategies for truth-telling. "[T]he traditional strategy, […] where accurate information is transmitted to the audience" now competes with "the newer transparency strategy, where truth-telling is created through forthrightness and discourse and is subject to change over time" (Karlsson, 2011, p. 283). That is, digital distribution models have left news outlets with two options. They can wait to publish a story until it is fully verified, thereby guaranteeing a more accurate story – or they can update continuously as more information becomes available. This continuous updating has effectively shifted the "curtain" between the backstage and frontstage of journalism, requiring news organizations to provide more visibility into their process (cf. Spayd, 2016; Sullivan, 2016).

Methods

Experiments in Transmedia is a four-year collaboration between an interdisciplinary non-profit social science research institute and the science reporting desk at a national broadcast news program. The project sought to understand a) how early career adults use STEM media and b) how best to support their STEM literacy through an interdisciplinary, mixed-methods approach.

Understanding the news production process is critical to determining how media organizations can advance early career adults' STEM knowledge, interest, and competencies. To do so, we structured our work as *participatory action research*, in which "some of the people in the organization or community under study participate actively with the professional researcher throughout the research process from the initial design to the final presentation of results and discussion of their action implications" (Whyte, Greenwood, & Lazes, 1989, p. 514). Bringing together transdisciplinary research teams of social scientists and journalism practitioners creates space for both to learn. As Perrin (2012, p. 5) notes, this kind of approach "contributes to practice by solving problems, to science by grounding and extending theory, and to society by changing social conditions."

There has been relatively little application of action research principles within the field of journalism. While little of this work appears in the literature, Niblock (2012) argued that journalistic practice is itself a form of research, and Perrin (2012) has used transdisciplinary action research to bring media scholars and practitioners into conversation. Niblock (2012, p. 506) suggests that action research may be particularly valuable to understand how journalistic methods are changing in response to new digital technologies. We continue in that tradition, understanding practitioners' expertise as a form of data and starting from a perspective that is "outward looking, contextual and format- or medium-driven into examining the form work will take" (Niblock, 2012, p.507).

This paper foregrounds the participatory action research process and its outcomes. This research process included four types of activities, taking place over the first three years of this collaboration:

1. Three cohorts of science news assistants – early-career journalists who are simultaneously members of the production team and of the project's target audience of early career adults – kept **regular journals** about their experience.
2. We conducted **interviews** with science news assistants in all three years.
3. In Year 3, additional news assistants who did not work on the science team contributed journals, and several of them participated in a **roundtable** to discuss their experiences, speaking as both news producers and early-career adult news consumers.
4. The social scientists and the full science media production team, including science news assistants, **met in person each quarter** over the life of the project to engage in deep reflection on media production, results, and theoretical explorations about cause and effect. These discussions allowed us to document changes in the production team's approach to making STEM stories for early career adults over the course of the project, as well as their thought process. The social scientists also presented emerging results from other research activities at these meetings, prompting conversations about how best to incorporate audience feedback into upcoming stories. Priorities for both research and production informed one another as a result of these meetings.

Participants

This paper's authors include four social scientists (from the fields of linguistic anthropology, education, psychology, and human science), nine current and former news assistants, and nine senior members of the news production team, all of whom participated to different extents in quarterly discussions during the study. The media practitioners include the managing producer for the team, two science news producers, a data reporter and producer, a senior editor on the digital team, the production team's digital director, the digital product manager, the news editor, and the in-house data analyst who

tracks story performance metrics. All but one news assistant fell within the target age group during their tenure, as did two social scientists and two additional members of the news production team.

Instruments and Data

We have provided prompts for journals, team discussions, exit interviews, and roundtables as supplementary materials for public review. However, individual journals and transcripts of interviews and meetings may not be shared due to IRB restrictions on the sharing of personally identifiable raw data. Specifically, the power dynamics inherent in the composition of our team make this data sensitive: authors of this paper with direct supervisory authority saw only synthesized data from more junior members of their team, many of whom are also authors of this paper.

Results

We present findings in chronological order to emphasize the longitudinal nature of the process, and the changes we have seen and experienced over the three years.

Editorial process, audience engagement, and "participation"

In meetings, the media practitioners on our team often focused on *engagement*. If the metric of a successful broadcast story is viewership – suggesting a unidirectional, one-to-many form of communication with a passive audience – the gold standard for social media stories is *engagement*, which includes comments, questions, likes, and reshares. That means the very measurement of broadcast and social media stories assumes different types of audience behavior.

Early in the project, our team had strong assumptions about engaging early career adult audiences. For example, all members of our team assumed that younger audiences were on social media but struggled to articulate whether content on those platforms was, or should be, different from traditional broadcast content. That difficulty seemed to suggest agnosticism about the relationship between news content and audience behavior. These assumptions also homogenized the early career adult audience, and tacitly informed all stages of the production process. Over three years, we have gained more understanding of differences *within* this audience group, in addition to factors that make this audience group unique. In focus groups and surveys, the social scientists have seen a spectrum of news behaviors, from those who make decisions primarily at the outlet level to those who make decisions primarily at the story level (cf. Spitulnik Vidali, 2010). The journalists have drawn similar conclusions from analytics data: younger adults are less likely to consume content from a particular outlet routinely, and more likely to make decisions on a single-story basis.

Over time, we have become increasingly able to articulate systematic differences between content produced for different platforms. Comparing the affordances of major social media platforms, the differences we observed include limits on text length, privacy settings, and the ability to easily re-share others' content while adding commentary. These constraints do not fully determine users' behavior – for example, Twitter users have long avoided length restrictions by replying to their own comments to create long threads – but they do facilitate different kinds of communication. Algorithms that control how quickly posts disappear from feeds, and more and less complex threading, also support different kinds of interaction.

In our first year, news assistants explored media formats and experimented with new techniques. They worked out the details of brand-specific storytelling techniques for Twitter, Facebook, and

Instagram, focusing on the interactive possibilities of each and their location in the storytelling ecology. However, they also struggled to increase accessibility and visibility in news feeds, given the opacity of social media algorithms. At that time, they made suggestions for the future that would make use of the affordances of online platforms for co-construction, such as live-blogging at science events. In the two years that followed, Facebook Live became a staple of the science team's reporting, and the team now regularly incorporates questions received through social media at the time of filming.

Years 2 and 3 saw experimentation with more ephemeral social media platforms, including Instagram Stories and Snapchat. These news assistants also highlighted the need for flexibility, noting that any given platform's affordances and technical specifications change constantly. Year 3 news assistants consistently identified Instagram as the most popular and promising platform overall, while there was less agreement about the usefulness of Snapchat. Some news assistants were excited about it, while others thought the platform's audience was younger than the engaged early career adults we sought to reach. One Year 3 news assistant noted that meeting the expectations of social media audiences was perhaps the greatest challenge:

> I don't think there are as many challenges in the tailoring of content as there are in the tailoring of delivery to this age group. Most of what [our outlet] covers is of interest to people of a wide range of ages, so I think the challenge lies in making content covered in the broadcast accessible and attractive to the audience online. … Reshaping content for different platforms and experimenting with different presentation across platforms … is a good way to reach this age group.

Within the team, we realized that our paradigms of audience engagement were not always aligned. In our meetings, social scientists struggled to understand comments like the one above, which conflate different online platforms with the different **audiences** of those platforms. Meanwhile, journalists held the position that that there is little practical value in differentiating between the demands of a particular target audience and the demands of the platform(s) where that audience is found. Through discussion, the whole team came to appreciate that different audience groups flock to different social media platforms (Smith and Anderson, 2018), and multi-platform journalism typically seeks to meet the audience where they are. In fact, acknowledging these two ways of seeing audience engagement helped us all think through our evidence in a new way, the hallmark of an action research frame for theory identification.

Broadcast genres and social media genres

There are systematic differences in content produced for the broadcast and content produced for social media, as well as systematic differences between content produced for different social media platforms. The precise nature of the differences, however, is always in flux: they change alongside the affordances of each platform, the practices characteristic of each platform, and the team's experience with and sophistication about social media.

In the first year of the project, many members of the team were able to articulate the differences only broadly, as a broadcast-digital binary. They explained the differences most clearly by comparing multiple different outlets. For example, at that time, news assistants asserted that traditional news broadcasts of STEM topics do not appeal to early career adults, especially in comparison to digital-first

outlets such as iflscience.com and digital-first teams such as National Geographic Snapchat Discover. They described these other outlets' content as shorter, more visually appealing, informal, relevant, and on the "pulse of cool science."

By Year 3, a news assistant illustrated the differences within the NewsHour's own content, writing:

> [T]he same content is allowed to take different shapes depending on the platform in which it is being presented. For example, a broadcast segment about flu season would have the anchor and an expert sit for a discussion, while the same topic would be addressed in Facebook as a Q-and-A, and on Twitter as a Twitter Chat with reporters and professionals engaging with the audience.

Notably, all three hypothetical versions included an expert answering questions of broad interest. However, the participant structure differs quite a bit, notably in the amount and type of mediation between the audience and that expert. On the broadcast, the anchor *speaks for* the audience, asking questions they believe the audience wants answered. On Facebook Live, the journalist *revoices* audience questions, and in a Twitter chat, some audience questions may be answered directly, while others still may be taken up and revoiced by the official moderator.

Video Products

In full-team meetings, we attempted to lay out a fuller taxonomy of the various "shapes" content takes in the science reporting team. In an effort to provide a direct comparison between the forms journalism takes on social media platforms, we focus our discussion here chiefly on videos rather than written text. Several journalists selected exemplary videos of each type, and we watched them individually before coming together to discuss the defining traits and affordances of each type. The table and descriptions below represent the consensus of our team of journalists and social scientists.

At the time of writing (summer 2018), the team produced six major types of science video. Three of them are regularly found on the nightly broadcast (Table 2):

1. **Leading Edge,** the flagship science series aired weekly, describes the state of the art in a STEM field or breaking science news topic, synthesizing multiple perspectives to gain a rounded view of some topic. They typically start with a familiar setting or person and present information at a middle- or high-school level, emphasizing the idea that science is an everyday occurrence. These pieces are long by broadcast TV standards, between 7 and 10 minutes.
2. **ScienceScope** videos center on one particular research project or invention. These pieces take a more straightforwardly explanatory approach, with higher information density and early-college-level vocabulary and science literacy assumed. They are also shorter, between 4 and 6 minutes.
3. **Shares** videos are character-driven stories that sometimes touch on science topics. They are strongly visual, and often feature a first-person scientist narrative. These videos tend to be uncontroversial and happy in tone and come in under 3 minutes.

The other three appear on social media platforms (Table 3). Two of these types are platform-specific, while the third is platform-agnostic:

1. In **Facebook Live** videos, which run longer than any broadcast content, the hosts typically do a deep-dive into an expert's research area by interviewing the individual live. The audience can

participate directly in these unedited, conversational interviews by submitting questions online, which a staff member filters for the on-camera hosts. If their schedule allows, the expert can answer other audience questions after the live video by responding in the chat thread.

2. The team uses **Instagram Stories** to provide a recap of, or background on, stories in the news. They also have unique technical specifications: they are produced in a vertical format; are often text, graphics and animation heavy; and consist of a series of short (5-10 second) clips. Instagram stories can be produced in the field as live or semi-live content or pre-produced at the production team's offices.
3. General **social-first videos** play two distinct roles. Sometimes they tell a breaking story in advance of the nightly broadcast. More often, they break down a topic to explain it. The host or hosts can play a presenter role rather than a reporter role, facing the camera directly. Alternatively, the track of a never-seen reporter may narrate relevant footage. These videos, which are always captioned, are usually short.

Table 2. Broadcast video types

	Leading Edge	**ScienceScope**	**Shares**
Typical focus	state of the art in a STEM field	a particular project or invention	a singular story or interesting character
Tone	serious but not academic	straightforward, information-dense, humorous	positive, light, strongly visual
Distinct stylistic features	opens with familiar setting or character	advanced vocabulary, assumes more advanced science literacy	often features person telling their story in their own words
Target audience	news audiences	"the Gizmodo audience," "nerds"	general news audience
Platform	broadcast	various social media and broadcast	broadcast, reshared on various social media
Length	6-10 minutes	4-6 minutes	under 3 minutes

Table 3. Digital-exclusive video types

	Facebook Live	Instagram Story	Social-First Video
Typical focus	deep-dive into an expert's research area	recap of or background on stories in the news	tells a story before the broadcast OR breaks down a topic to explain it
Tone	conversational	succinct, casual	information dense, typically lighthearted or humorous
Distinct stylistic features	live interview, unfiltered, audience interaction	vertical orientation, series of short clips, always captioned, usually silent, internet colloquialisms	head-on to camera or narrated, always captioned
Target audience	topic aficionados	early career adults, particularly the younger half of this audience	general news audience
Platform	Facebook	Instagram	various social media
Length	15 minutes or longer	under 2 minutes	2-4 minutes

Note: each video type has some subtypes. For example, the popular *Ask a Scientist* is a type of social-first video.

We identified some distinguishing characteristics of each individual type of video, as well as some similarities across types. For example, broadcast videos are generally more serious in tone than social media videos – and broadcast videos are also longer than all social media videos except those presented live. ScienceScope deserves a special mention here: this series is long by social media standards but short by broadcast standards. Initially conceived as a social media series, most ScienceScope videos now air on the broadcast.

Production team staff noted other differences between broadcast and social media. Between the appointment-viewing model assumed by broadcast news and the gatekeeping structures that perpetuate legacy broadcasters' authority, media practitioners agreed that audiences expect higher production values on the broadcast. Meanwhile, they believe that viewers may actively prefer less polished videos on social media for several reasons: these platforms are seen as immediate – and a wider range of people can and do use them.[5] The Instagram Story format, in particular, is both immediate and ephemeral, which means that, in the words of one media practitioner, "as a content producer and as the person receiving that content, you're expecting a much more casual, authentic piece of content."

Genre, Style, and Medium

From the newsroom perspective that privileges content creation, these different types of videos are different products: each has its associated workflow. With an eye to audiences, we might most fruitfully consider them as six separate *genres*. A *genre* is a set of formal features and structures that go together and, crucially, provide expectations about the type of communicative event (including talk, text, or video) that people are participating in (cf. Bauman, 2004, pp. 3-4). Genres help us understand what kinds of participant structures apply, and what roles are available. The features and structures that define them are not exclusively the province of style, nor are they characteristics of the medium alone (cf. Spitulnik, 2000). Rather, both are critical to the concept of genre.

In the journalism context, *style* can clue us in almost immediately to the type of story we are reading, listening to, or watching (cf. Cotter, 2010, pp. 152-164 on leads). Consider the difference between **news** and **feature** stories. For example, the first sentence of a news story nearly always uses **preterite verbs** and temporal adverbials to ground its audience in the immediate past:

- "Speaker Paul D. Ryan **told** House Republican colleagues on Wednesday…" (Martin & Burns, 2018)
- "President Trump **put** Syria and Russia on notice Wednesday morning in a Twitter post…" (Sullivan & Shear, 2018)

Meanwhile, evergreen or feature stories typically use the *present tense*:

- "Different studies *offer* varying assessments of how many people *use* dating sites and apps, but what we can say with certainty is: a lot" (Safronova, 2018).
- "In the unpolished video that appeared on state television one October morning in 2015, Wang Yu, one of China's most prominent lawyers, *denounces* her own son" (Myers, 2018).

These stylistic cues prime our expectations about the piece we are beginning to read, watch, or listen to.

Even when style is held constant, the *medium* also contributes to our expectations about participation. For example, identical articles[6] printed in a newspaper and on that newspaper's website have materially different participation structures. If you want to respond to the author of a print article, it is necessary to switch channels: you can write a letter to the editor or look up the author on Twitter – but you can't just scribble in the margins and expect the author to respond. If you want to discuss that print article with other people who have read it, you either have to find them first or encourage others to read it. Meanwhile, online comments on websites allow for both these types of dialogic participation within the same channel as the original piece.

Considering *genre* in this way allows us, then, to understand the shift in tone on social media described above. By developing pieces that are chattier and less polished, producers parallel the affordances of the medium itself: both style and medium encourage direct conversation.

Shifting Genre Conventions over Time: The Explainer

One particularly clear example of the team's experimentation with form and genre is the explainer video. Explainers are "short video[s] intended to bring clarity to complex issues, establish baseline knowledge for the viewing public, and create more engagement in future mass media coverage related to the topic" (Sandlin, 2016, p. 67). Rather than reporting on breaking news, they provide necessary context to understand that news.

Science media may benefit particularly from explanatory pieces (cf. Long, 1995). Many people perceive STEM topics as difficult, and explainers mean fewer barriers to entry based on content knowledge. As one news assistant put it:

> "[Journalists' job] has always been to make something easy to understand … but now it's inherent in the form …, [such as] articles that are simple questions and answers and really easy layouts that make information concise and easy to understand."

Explainer videos use a participant structure that feels more interactive than traditional broadcast formats: in most outlets' explainer videos, the narrator speaks directly to the audience, positioning them as an interlocutor. Meanwhile, traditional broadcast news typically positions its audience as the overhearer of a dialogue between two or more speakers.

The NewsHour production team currently creates two styles of explainer, both within the **social-first video** category described above (see Table 3), that help to clarify the boundaries of this particular genre. These styles differ primarily in the choice of narrator; those choices impact other aspects of the production process and may also impact audience participation.

Science producers make short **digital explainer** videos mirroring the distinctive tone of ScienceScope. Like ScienceScope videos, these shorter explainer videos featured science producers as direct-to-camera narrators, and graphics and b-roll were layered over the reporters to illustrate what they were describing. After about six months of experimentation, this style was expanded to **Ask a Scientist** videos. These videos feature a scientist or other expert speaking directly to the camera, explaining their take on a scientific question. Like ScienceScope and digital explainer videos, they are also layered with illustrative video, graphics, and captioned text.

Both types of explainers are similar in style: an expert faces the camera, speaking directly to the audience in a conversational tone. The expert's face alternates with explanatory graphics and illustrative video, depending on the topic. These videos are captioned for both accessibility and the realities of public consumption on mobile devices.

They are also embedded in a similar larger participation structure on the NewsHour website. In particular, all explainers are posted in conjunction with a written piece that goes further into the subject and includes other expert voices.

While there is relatively little research on explainer videos, some evidence suggests that they are particularly effective for audiences with low involvement and low subjective knowledge (Krämer & Böhrs, 2017). We anticipate that the choice of expert (here, either science journalist or scientist) may affect audience reactions to, and participation with, the explainer.

From a production perspective, the choice of expert has notable consequences. Traditional explainers – including this team's digital explainers – are typically filmed in the studio and do not require travel, which makes them quicker and less expensive to produce than many other types of news content. They're also scripted and generally do not contain sound bites directly from interviews, which means that producers can ensure the language is as quick and easy to follow as possible. That provides greater control over length than is possible in a story that relies on audio from interviews. Meanwhile, Ask a Scientist is more challenging to produce because they are edited from unscripted interviews with scientists.

For audiences, experts' role is made salient through an introduction that positions each type of expert differently. Science journalists introduce themselves or are introduced only through screen captioning -- while scientists are introduced in Ask a Scientist through a voiceover that notes their credentials. This style of introduction positions the scientists explicitly as subject matter experts (cf. Clayman & Heritage, 2005, p. 60, 70; Calsamiglia & López Ferrero, 2003). In the future, our team plans to explore how this positioning impacts audience participation. For example, journalists may be more willing than scientists to monitor and respond to social media comments, scaffolding more direct participation over a longer period of time. Audiences may also perceive journalists and scientists differently in terms of their authority, accessibility, and other dimensions, any of which may affect audience members' willingness to describe, discuss, or recirculate the videos.

Discussion: Poetics and Pathways to News Consumption

As we started to unpack the affordances of different media, a news assistant observed that some stories attract audiences for aesthetic reasons, that is, because the stories are "gross, cute, funny, or just plain weird." There are parallels between the aesthetics of genre and the *poetic* function of language, which recognizes form itself as a key element of what is being communicated (Jakobson, 1960). From an audience perspective, the STEM content may be entirely incidental to the story's appeal. A focus on form and poetics has the potential to engage people who are visually oriented and interested in the "color and texture" of a story, often through the use of visuals such as graphs, tables, and charts. Not simply visual, though, this poetic orientation can also describe textual form, such as the use of rhyme or alliteration.

In short, **audiences are drawn to stories that are exemplars of their genre, fully meeting expectations about both form and content**.

In addition to evoking the "weird" or the "gross," another option might be to highlight different forms for particular media. For example, infographics are particularly suited to Instagram because they communicate a lot of information through a single visual.

As both producers and consumers, we consistently approach social videos with expectations that are different from our expectations for broadcast pieces. If you're watching news on TV, you expect 1) an anchor to introduce each story, which 2) lasts from five to ten minutes, and 3) follows a certain narrative arc. On the other hand, if you're clicking through videos in a social media feed, you expect a story that 1) is shared by a source familiar to you; 2) doesn't go on too long; and 3) gets to the point quickly. You also probably expect those social media videos to 4) use humor, immediate visual appeal, a simple anchoring claim that relates to a user interest – or a combination of the three – to frame your participation, treating you as a direct addressee.

Beyond these structural expectations, we see another large difference, this one stylistic: both producers and consumers expect social videos, whether live or pre-recorded, to be less scripted and less heavily-produced than broadcast videos. The more candid, snapshot perspective that tends to characterize social media pieces often situates both the production staff and external interviewees as relatable people engaged in an in-the-moment experience or process, one that includes the viewer. Popular social media stories may include spontaneous emotional responses that give audiences a sense of the nuanced personalities of those involved. In addition, the perception that social media is more short-lived also seems to create expectations on both sides for more vulnerability and authenticity. On the other hand, audiences may expect more reflection and depth in broadcast content due to a production cycle they perceive as longer. In short, considering genre expectations provides guidelines for producing appealing content of all types.

Limitations and implications for the future

In this case, participatory action research proved valuable to both media practitioners and social scientists: the ongoing reflective process helped practitioners to refine production and gave social scientists insight into the lived experience of working in a field undergoing rapid technological change. While we see this method's great value for the field of journalism, we also recognize several limitations, which it shares with other ethnographic and phenomenological research methods. First, it requires an extraordinary time commitment from all participants, which makes it difficult to conduct at large scale. Second, it cannot guarantee representativeness: we recognize that the pressures and challenges facing journalists at this particular outlet may differ systematically from those at other outlets.

In acknowledging the above limitations, based on the results of this work, we believe those challenges are more than offset by the method's attention to positionality – recognizing how our varied roles may impact what we perceive and triangulating between those different perspectives – is a strength of this methodological approach. We see three directions that might be fruitful to explore in the future, impacting both research and media production.

Expansion to other topics: While we focused specifically on the production of STEM news, we anticipate that this structured reflection process would be valuable for other types of news or documentary production, and that our findings will be relevant for news and other information media production more generally. Comparing the different pressures that different types of information media teams face may further elucidate variation from the findings reported here.

Expansion to other audiences: We focused specifically on early career adult audiences' relationship to news, which may constrain our results. A similar approach to other audiences would also be valuable to ensure news stories are inclusive of those audiences. For example, if we are interested in producing news that feels inclusive of women, we might want to consider the gender identity of team members rather than their age in our triangulation.

Including non-expert audiences in the reflection: Participants in the present study were social scientists and journalists. We did not explicitly include the perspectives of audience members without professional expertise in media research and/or production but did collect user feedback on media assets over the life of the project to inform our dialogues. While we all contributed our own reflections as news consumers, future studies inviting NewsHour audience members to reflect alongside us would allow us to triangulate further – and support citizen co-creation of news alongside professional journalists.

Conclusion

We have considered audience engagement from the standpoint of *participation frameworks*, which reminds us that we cannot understand practices of news consumption in isolation from practices of its production. In doing so, we have traced the characteristics of six genres of science news video that this team produces and compared audience expectations for television and new media news videos. In general, broadcast videos position their audiences as overhearers while social media videos typically position their audiences as interlocutors, and these tendencies have in turn shaped audience expectations of these two types of platforms.

We also point to the value of participatory action research as a framework for developing theory within professional practice. Our ongoing collaboration has been valuable to the social scientists and media practitioners alike. The metacognitive process used to facilitate our quarterly meetings and explain our work has given the journalists tools to refine their production process through a better understanding of audience expectations and the ways that each video genre shapes and is shaped by those expectations. At the same time, privileging the perspectives of news producers has prevented the social scientists from overlooking day-to-day changes in the work of journalism that are created by rapid shifts in technology, such as increasing demands for both speed and transparency.

NOTES

[1] We focus on *early career adults* (a life stage: those ages 18-35 and not in school) rather than *Millennials* (a generation: those born between 1981 and 1996 (Dimock, 2018). However, these two groups had significant overlap during our study.

[2] For a similar turn in the field of communication, see Lievrouw (2009).

[3] While a story may ultimately be reported by a single author, these decisions are made through interaction as well: it takes a team to determine what is newsworthy, trustworthy, and authoritative.

[4] However, marginalized communities on social media remain highly skeptical of mainstream news outlets and are more likely to retweet or share content from other sources (Freelon, et al., 2018).

[5] Within the realm of science communication specifically, user-generated content outperforms content developed by professional media on YouTube (Welbourne and Grant, 2016).

[6] In fact, print and online articles rarely converge perfectly. An early study of print and web editions of national papers found that online articles corresponded less and less to the original print over the course of the day (Mensing and Greer, 2006, cited in Karlsson, 2011). Content need not even start out identical; both producers and consumers hold strong ideologies about the affordances of various media and the types of content that are most suited to each one (e.g. Nielsen, 1997, 2008; Shea, 2015). Yet these ideologies are contested: between 2015 and 2018, newspapers of record have debated how transparent to be in online updates, led by the Washington Post, Vox, and Buzzfeed posting links to prior versions of their articles (Spayd, 2016).

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