STEM NEWS

IN THE LIVES OF EARLY CAREER ADULTS

PBS NEWSHOUR AND NEW KNOWLEDGE ORGANIZATION INVESTIGATE

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EXECUTIVE SUMMARY

This report presents emerging thoughts from an ongoing research collaboration to understand how U.S. early career adults — defined as individuals ages 18 to 35 who are not currently in school; many of whom were raised with ready access to a media-rich world — engage with STEM (Science, Technology, Engineering, Math) news content. The four-year project is a collaboration between the PBS NewsHour Science Reporting team and New Knowledge Organization Ltd. (NewKnowledge) and is funded in part by a grant from the National Science Foundation.

In this paper we provide summaries of our preliminary findings and suggest that early career adults do not have low attention spans, a critique often leveled broadly at people from this generation. Rather, our findings indicate that the vast amount of information available at the touch of a screen has helped refine editorial skills so that young professionals restrict the flow of information to content they find most useful. In contrast to studies that try to pathologize media use, we have found that early career adults are diligent consumers who quickly scan across content before choosing which information to consume.

We offer insights into some of the distinct motivations for STEM news consumption by early career adults:
- self-identification as a science person
- aesthetic appeal associated with specific story features
- relevance to the individual
- appeals to morality.

We close with recommendations for STEM media producers that we believe can increase appeal to a broader audience than those with a self-defined fondness for all things STEM.

AUTHORS' ACKNOWLEDGEMENTS

This report represents emerging thoughts from an ongoing four-year research collaboration to understand how U.S. early career adults (ECAs) engage with STEM news content. The project is a collaboration between the PBS NewsHour Science Reporting team and New Knowledge Organization Ltd. (NewKnowledge); however, all opinions expressed in this white paper are the thoughts of the two authors, who are independent researchers and do not represent PBS NewsHour or its staff. The Norman Lear Center at the Annenberg School of Communication and Journalism at USC and the SeeChange Institute served as external evaluators for this National Science Foundation-funded project.

As part of the lead author's Fellowship at the Lear Center, we prepared this white paper to capture our thoughts on the current state of news media for early career adults. The co-authors of this paper are 58 and 34, respectively, and have reflected on the rapid evolution of the mediascape in both of our lives. While we refer to young people as *they* throughout this paper, we acknowledge that both first- and third-person pronouns are inadequate to address our positionality as co-researchers. When we (the authors) use *we* and *our* (the pronouns) to refer inclusively to young adults, these pronouns are italicized even though only one of us can claim to be a representative of this younger generation.

As authors, we also acknowledge that young American adults come to these questions with many different opinions and perspectives. The two authors of this paper are part of a larger research team. Some of us happen to fall within the age brackets for this study, but we cannot represent the full range of lived experience of our contemporaries. We also acknowledge that as researchers, we approach this work as an environmental media psychologist (Fraser) and a linguistic anthropologist (Barchas-Lichtenstein). We work as part of an interdisciplinary think tank and wish to acknowledge that this paper would not have been possible without the thought work of our collaborators at NewKnowledge, PBS NewsHour and the Lear Center who called our attention to theory from human rights education, journalism, media sociology, transformative critical pedagogies in education, and library and information science. It is this ongoing dialogue that allowed us to mark our current thinking with this white paper.

INTRODUCTION & METHODS

This report represents emerging thoughts from an ongoing four-year research collaboration to understand how U.S. early career adults (ECAs) engage with STEM news content. Early career adults are ages 18-35 and not in school; at the time of our research, most early career adults were Millennials (born 1981-1996, cf. Dimock, 2018). The research offers insights into the news consumption habits and preferences of this audience, given recent technological and social changes. Our findings indicate that ECAs do not have low attention spans, but rather that the sheer volume of available information requires ECAs to become highly discriminating curators of information. These adults are concerned that a news piece gets right to the point, makes the story relevant, and then elaborates efficiently.

METHODS

This mixed-methods research effort collected qualitative and quantitative data in parallel from several different sources. Data collected from early career adults focused on their overall news consumption and sharing habits, as well as their reactions to STEM stories produced by the PBS NewsHour for various platforms. We also worked with the NewsHour production team as participatory action researchers, peers in the research endeavor. Finally, the stories themselves provided a rich source of data.

Early Career Adults as STEM News Audience
Research activities conducted with this audience included:
- Recruitment of national panel; surveys to gather reactions to various stories produced by the NewsHour team, distributed through a national panel recruited through Amazon's Mechanical Turk and TurkPrime (Years 1-3);
- A baseline survey about general news consumption patterns and social media use, and a follow-up survey for those who consume STEM news weekly or more (Year 2);
- Focus groups to provide insight into the complexity of all topics (Years 2 and 3);
- Comparative focus groups with other adults (ages 36+) to determine what is unique about the early career audience (Year 3); and
- A national pre-/post-production study of early career adults' views of the opioid epidemic, as well as their reaction to NewsHour stories on the topic (Year 3).

PBS NewsHour Production Team

Research activities conducted with project stakeholders included:

- Quarterly discussion groups with the full project team to explore the production team's approach to producing STEM stories and reflect together on research results (Years 1-3);
- Journal entries written by early-career news assistants at the NewsHour, reflecting on their dual position as news consumers and producers (Years 1-3);
- Interviews with early-career news assistants on the science team to gain additional depth of understanding (Years 2-3);
- A roundtable with early-career news assistants both on the science team and other teams at the NewsHour to discuss commonalities and points of divergence in journal entries (Year 3).

Analysis of NewsHour Stories

In addition to working with news consumers and producers, we also examined the stories themselves as a source of data. Activities included:

- Tracking stories produced by the NewsHour science team and coding them by topic area (Years 1-3);
- Coding stories produced by the NewsHour science team by overall story frame (Year 3);
- Coding two weeks' worth of stories produced by the NewsHour, both inside and outside the science team, to gain a sense of the overall frequency of STEM content (Year 3);
- Content analysis of Facebook stories that performed particularly well or particularly poorly with the target audience (Year 3).

HANDLING THE FLOW:
EDITORIAL CONTROL & NEWS CONSUMPTION

News used to be a choreographed production. Today it has become modular, and those pieces are recontextualized by news aggregators and background algorithms. Put differently, our news has always been curated, but now the curators have changed.

Media users can now receive content on multiple devices at the same time, and the choices we make about media respond not just to technical affordances but to social settings, time, and other elements of our lived experience. Although a household may view a TV news program together, each member may be doing something different on their second screens. A family member may seek out supplementary information about a new scientific finding as the story unfolds on screen, while others may dig deeper into alternative news items from earlier in the broadcast on that same program, or may simply surf whatever their feed offers at that moment. In each case, the user is making content consumption decisions that remain hidden to most algorithms.

In 2017, we conducted focus groups with early career adults — defined as 18 to 35 year-olds who are not currently in school — in four cities around the U.S. to understand their attitudes towards news, their news consumption routines, and their reactions to a varied set of professionally produced news pieces. In 2018, we conducted a similar series of focus groups in three more cities and paired these with focus groups with adults age 36+ to determine what is unique to the younger group.

Preliminary results from these focus groups suggest that ECAs tend to make decisions at the story level, while those in the older group tend to curate at the source level. The older people in our focus groups typically subscribed to at least one news outlet, whether in digital or analog form, and their routines included regular engagement with that outlet or outlets. ECAs engaged with news just as frequently, but were more likely to say they happened upon it via friends (e.g., reposts on social networks), or news aggregators (e.g., Reddit). As a result, they saw news from a wider range of sources and had to make case-by-case decisions about what content to pursue.

Debra Spitulnik Vidali (2010, p. 375), who interviewed 78 young adults (age 18-25) between 2006 and 2008, observed a similar phenomenon: "[Young adults'] news consumption was primarily what I would call selective, episodic, and often referral driven, rather than broad, routine and outlet driven." It may be that increased prevalence of sophisticated algorithms and targeted personalization of content are exacerbating this earlier trend.

As you might expect, there was no sharp distinction between the two age groups. Age alone cannot be attributed exclusively to how news is selected, and neither group was monolithic, with substantial variation within each set. For the most part, we saw a gradient of attitudes and self-reported behaviors. Behaviors and attitudes of both the youngest ECAs and retirement age respondents were the most extreme, while Generation X participants (late 30s to early 50s in 2018) fell in between. In fact, ECAs between the ages of 30 and 35 were increasingly similar to the older adults.

Diligence

Despite widespread claims that young adults are less engaged with news than ever before (e.g., Poindexter, 2012), five-sixths of Millennials say that keeping up is at least somewhat important to them (Media Insight Project, 2015). However, many find this increasingly difficult, even overwhelming. An all too common perception is that there is an overwhelming volume of information constantly available for users, who also express concerns about the content itself (cf. Spitulnik Vidali, 2010, on the stances collapsed under the single term "disengagement"). At NewKnowledge, we hear it across our media projects, especially from teenagers and young adults: "There's too much to sift through," and "it's hard to know who to trust." After all, only 27% of American adults say they are "very confident" they can tell the difference between facts and commentary or opinion (Knight Foundation, 2018).

In short: consuming news requires more diligence than ever before. Selecting content requires making judgments about trust and clarity as well as relevance and topicality, which we discuss in the next section. Just because the volume of available information has increased does not mean that the human mind can process more information (Sanbonmatsu, Strayer, Medeiros-Ward, & Watson, 2013). Rather, today's consumer is simply applying executive control to how they will dedicate their available time. For the rest of this report, however, we focus only on the proportion of that time they are willing to consider STEM news content.

STEM NEWS CONSUMPTION, EARLY CAREER ADULTS & MOTIVATION

A 2015 study conducted by the Media Insight Project found that more than 40% of young adults reported following science and technology news, specifically. In reference to their general news viewing, about three-quarters cited civic motivations,

while about two-thirds mentioned social or practical reasons to keep up. However, reasons to consume STEM news may be different from reasons to pay attention to the news in general.

On the ego-driven end of the spectrum, those who identify as science people are highly motivated to consume STEM news. In a 2017 study conducted by the Pew Research Center found that only about 17% of all Americans are "active consumers" of science news (Funk, Gottfried, & Mitchell, 2017). These active science news consumers are also the people most likely to go to informal science learning centers, participate in citizen science, and have science-related hobbies.

In Fall 2016, we asked 90 early career adults who said they follow STEM news at least once a week to tell us about a story they had recently consumed. Nearly two-thirds said the story appealed to them because they were interested in the topic. Each time we asked our online audience panels to rate STEM news content in a variety of ways, science identity had positive effects on nearly all of these factors.

> **Audiences are highly motivated to consume STEM news stories that connect to their personal lives or to moral questions, even when those audiences don't identify as science people.**

We also see a more relational motivation: Audiences are highly motivated to consume STEM news stories that connect to their personal lives or to moral questions, even when those audiences don't identify as science people. Twenty-two percent of the adults in our Fall 2016 survey said that they were interested in a story because it impacted them or someone close to them. Similarly, many members of our audience panels described stories as "personally relevant" when they impacted large numbers of people.

Science Identity & Stereotype Threat

These findings leave us with two possible interventions to broaden the appeal of STEM news to more ECAs. We can try to increase the number of people who identify as science people, or create STEM news content featuring appeals to morality and other relational motivations. One reason to emphasis the latter strategy is that science identity is not equally available to all groups. Studies beginning in the 1990s by Steele, Aronson, and their colleagues (Steele & Aronson, 1995; Aronson, et al., 1999; Steele, Spencer, & Aronson, 2002; Murphy, Steele, & Gross, 2007; etc.) have shown that stereotypes about who is good at science and math – linked to gender, race, ethnicity, and other demographic traits — have a self-perpetuating effect, known as 'stereotype threat.' Our preliminary results from focus groups and from our online audience panels seem to suggest that someone can enjoy a STEM story, yet not feel confident they understand it well enough to share it on social media or even talk about it. This lack of confidence may derive from stereotype threat.

This can be a tough hurdle to overcome, as our own research in collaboration with Asbell-Clarke at TERC on educational video games showed that appealing to audiences with high intrinsic motivation can actually widen gaps rather than leveling the playing field (Fraser, Shane-Simpson, & Asbell-Clarke, 2014).

While our research links science identity to consumption patterns for STEM news, we caution that use rate should not be confused with expansive contributions to STEM literacy in the nation. In fact, we propose the opposite: STEM identity may be a ready market that creates a baseline consumer population that is generally self-motivated to attend to STEM material. We recognize that this is a valuable community for content producers, but it may not present opportunities for growth or

expanded impacts in the form of broader public advancement of STEM literacies.

The Aesthetics of STEM

Another motivator for consumption of STEM content we witnessed in this study was an aesthetic entry point. Some STEM content performs well with audiences because it's "gross, cute, funny, or just plain weird," as one News Assistant pointed out (see Barchas-Lichtenstein, et al., in review). Conversations with young journalists suggest that this type of appeal is particularly important for short social media videos. For some audiences who feel less confident engaging with the content, aesthetic judgment may also help by providing a more relevant entry into STEM that is not threatening to their ego, primarily because understanding the material is not a primary goal. Rather, they appreciate the presentation as an artifact itself.

Relevance & Morality

Our research is starting to reveal that the higher viewership rates or lower attrition in attention to programming are those that link STEM news content to moral and relational concerns.

Preliminary results across all research activities suggest that audiences pay attention to content they describe as "relevant." In teasing apart this concept of relevance, we see two ways of conceptualizing it: a narrow view and a broad view. The narrow view sees a story as irrelevant if there is no immediate personal connection; the broad view understands a story of general human interest as relevant. We describe the narrow type of relevance (e.g. "I read the story because my wife has an iPhone") as *relational*, while the broader type of relevance would be moral (e.g., "I read the story because I worry about what iPhones are doing to our society").

When we describe moral questions, however, we don't suggest these issues are all life or death, exclusion or oppression. Rather, they have surfaced in our experiments through sarcasm in Facebook Live broadcasts where ironic statements indicated a more deep-seated moral conundrum. In one case, robotic-enhanced prostheses shown on a broadcast generated a range of commentaries that used humor and irony to question the degree to which people might give up control to machines. While the story focused on new technologies, the

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commentary feed sought to anchor the technologies in a moral conundrum that may not be life or death, but worthy of philosophical consideration.

Triggering moral judgements

Based on the data we have collected to date, we are starting to suspect that appeals to morality drives viewership of some STEM content. Stories which feature deliberate appeals to morality within the opening framing receive increased viewership and diligence in viewing (e.g., lack of attrition). However, a deliberate appeal to morality need not explicitly appeal to any particular norms, values, and principles (though norms, values, and principles are inherent to any reporting choices and approaches). Rather, reporting can provide the information a potential audience for STEM content might seek to determine their own moral judgments — including permissibility, wrongness, and blame. (For more on blame judgments, see: Malle, Guglielmo and Monroe 2014; Voiklis, Kim, Cusimano, & Malle, 2016; and Monroe, Dillon, & Malle, 2014.)

A more deliberate appeal to morality would engage the audience by defining a causal agent, an entity impacted by the agent, and a known reason. "Where" and "when" can follow soon after to help establish spatio-temporal relevance to the media user. The inclusiveness of "who" and "to whom" is a more important component of relevance — i.e., does the event involve the audience and the social group(s) to which they can be inferred to belong? Moral norms and principles are group specific: people expect and enforce compliance with group norms mainly among group members, sanctioning in-group members who violate those norms and protecting in-group victims (Bernhard, Fehr, & Fischbacher, 2006; Goette, Huffman, & Meier, 2006). Meanwhile, out-group violators may incite inter-group conflict and out-group victims may inspire intergroup pity, but neither invites moral enforcement.

Featuring deliberate appeals to morality in the opening framing for a story may increase viewership or diligence in viewing STEM news. Engage the audience by identifying the causal agent among or supported by an audience's social group(s) and a violation among an extension of that social group. Without this information, stories are more likely to be coded as (non-moral) happenstance that does not produce sufficient relevance to warrant viewing beyond an opening sequence.

IMPLICATIONS

Our studies in STEM news consumption are starting to suggest that volatility in viewership should not be uniquely attributed to the story itself. We suggest that news organizations that seek to support advancement of public STEM literacies may be able to broaden the appeal of their content to ECAs by carefully crafting their offerings mindful of the layered reasoning that drives consumption.

For producers, we suggest further investigations testing and considering media products based on the tools used by the end consumer. Deeper understanding of the behaviors surrounding media consumption may also aid decision-making in the production process. In particular, we recommend considering not only optimal consumption devices but also the social context of consumption.

Producers may also benefit from more nuanced research into the relational motivations for sharing content to create targeted stories that maximize these features for specific audiences.

Producers may also benefit from more nuanced research into the relational motivations for sharing content to create targeted stories that maximize these features for specific audiences.

As "science people" represent a stable market for STEM media, direct appeals to this group as an intellectually curious community is unlikely to increase the number of people engaging with the content. Rather, this STEM news feeds the existing market with new information that supports their social capital. To make full use of the interest of these "science people," we need to better understand how and why they share STEM news stories with others – through conversations and individual messages, not only on social media.

We believe that the most valuable opportunity for expanding consumption of STEM news among ECAs is tied to enhancing perceptions of relevance and moral concern. The use of light humor, irony, outrage, or other emotional links consistent with

a news source's brand are all relevant tactics, but they should invoke a moral position within an opening set-up to be perceived as relevant. More deliberate use of second-person framing devices may also encourage audiences to recognize its direct relevance.

Finally, we suggest that the ECA audience does not have a low attention span. If anything, this audience comprises active and diligent consumers who devote time to seeking novel content that is relevant to their lives. They are experienced editors broadly sampling for content they find relevant, and allocate their time by efficiently eliminating any content that does not pass muster in its opening sequence. By accepting the editorial decision-making of consumers, the challenge to STEM media editors and producers is to accept the tactics they have in their control that can determine widespread consumption.

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