New and old narratives: changing narratives of science documentary in the digital environment

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Introduction

The mechanism for delivering videos has changed radically in the digital age, especially with regard to the rapid proliferation of videos consumed via the internet. On YouTube alone, 300 hours of video are uploaded every minute of the day and 4.95 billion videos are viewed every day by its more than 1.3 billion users.[1]

Web 2.0 features of the internet potentially allow for interactivity, multiple pathways, collective narration, social media influences, and user input. According to Page and Thomas (2011), "Interactivity is repeatedly cited as the feature of digital media that most clearly distinguishes it from older, nondigital genres." Narrative theorists go so far as to describe this as no longer the age of the author or artist, but rather, the viewer (Casacuberta 2003). Their assumption is that techniques of storytelling for the digital age will change in order to deliver these new capabilities and means of consuming video to the viewer (Koenitz and Knoller 2017). Even when analysis of online videos show they do not vary much in their narrative forms from those of films produced for the more traditional mediums of theatres and television, narrative theorists cling to the idea that it is only a matter of time: that what is happening in the digital environment is an evolving process (Romero and Centellus 2008) and, in the years to come, online videos will be augmented by storytelling possibilities not yet imagined (Page and Thomas 2011), with interactivity being the "Holy Grail" (Koenitz and Knoller 2017).

Indeed, there is a history of narrative in films evolving in concert with technological changes (León 2007). The first cinematic moving images had no narration at all, such as those by the Lumière brothers e.g. *La sortie des ouvriers de l'usine Lumière* in 1895 and *L'arrivée d'un train à La Ciotat* in 1896 (Barsam 1992). In the 1920s, a style of documentary developed whereby a "voice of God" narration was used to build persuasive arguments and add credibility to the information in film. This *expository* style, as it came to be called (Nichols 2001), uses an authoritative voice layered over top of the images. Despite the many other narrative forms and documentary styles that have been developed and experimented with over the ensuing 100 years, the expository

[1] Source: Statistic Brain http://www.statisticbrain.com/youtube-statistics/

form remains by far and away the most common narrative form for science films (Nichols 2001, León 2007).

In contrast to expository narratives – or non-narrative forms as they are sometimes known (Wolfe and Mienko 2007) – the use of storytelling (where something is at stake) can often allow for more effective communication, thereby increasing the impact of a science documentary by elevating audience engagement and increasing memory recall (Haven, 2007). How information is presented, it turns out, is at least as important as what information is being presented. Storytelling, then, might be expected to flourish in the online environment, providing a potentially useful tool to give science videographers an edge in a digital realm where competition for viewers is fierce given the vast amount of product available.

Another means of increasing comprehension when communicating science is to reduce the use of jargon, replacing specialised and unfamiliar scientific terms with more familiar words (Stahl and Fairbanks 1986). Experiments on the communication of science have repeatedly shown that narratives that eschew jargon and employ storytelling techniques not only improve engagement, they also improve comprehension and information retention (McNaughton 2015).

Some producers of online video, particularly some digital-born companies have tried to distinguish themselves from the so called "legacy media", by using an informal style. This leads to a type of narration in which the information is not presented in the classical formal manner of news and documentaries but in a chatty tone that intends to tell the topic in the way that resembles a personal conversation (León and Erviti, 2016).

By examining a large sample of online videos about three science topics – climate change, vaccines and nanotechnology – we sought to determine whether interactivity in the online medium has become a feature of their narratives, as predicted by narratologists. To determine whether these videos conformed to best practice for communicating science (Davis 2010), we examined the extent to which they used jargon and storytelling and how this varied across a range of different types of video producers. We analysed how the formal professional approach to narratives apparent in traditional filmmaking had been applied in the online arena versus a more informal, organic approach to narrative. Finally, we looked at the purpose of the filmmakers: whether they presented science in an impartial manner or if they had an agenda, seeking to persuade the viewer to accept a particular viewpoint about the science.

Results

Of the 826 online science videos examined in this study, over 99% (n = 819) had some form of narration, underlining the key and almost ubiquitous role that narration plays in communicating science in online videos.

One of the significant impediments to communicating science to lay people in any form of media has traditionally come from the use of narratives that are laden with scientific jargon. A notable feature about the communication of science in the online video arena is that this lesson has largely been learned with only 14% (n = 114) of the 826 videos containing jargon. However, there was a highly significant difference in the likelihood of jargon being used depending upon the type of producer of the videos ($\chi^2 = 53.45$, df = 6, $P << 0.001$), with jargon being much more likely to be used in videos emanating from institutions, be they scientific or non-scientific institutions, where it occurred in over a quarter of all their videos (Table 1.). Conversely, the producers for whom public communication is their primary mission (i.e. television and online newspapers) had very low usages of jargon (5.6% and 8.4%, respectively). Somewhat surprisingly, perhaps, user generated videos had around a two- to three-fold higher likelihood of containing jargon (15.0%) than videos produced by these traditional media outlets. If there was a positive about those producers utilizing jargon in their science videos, it was that the more likely a type of producer was to use jargon, the more likely was the producer to explain the jargon ($r = 0.76$, n = 7, $P < 0.05$).

The vast majority, 84%, of the online videos (n = 696) presented science in a formal manner. This was true of all types of producers except the user-generated videos where, in contrast, the majority (54%) were presented in an informal style (Table 1).

Table 1. Use of Jargon and Narration Style in Online Science Videos according to the Type of Producer.

Type of Producer	Videos	Jargon	Narration

		Yes	No	% Jargon	Explain Jargon	% Explain	Formal	Informal	None	% Informal
Online newspapers & other media	238	20	218	8.4	5	25.0	214	22	2	9.2
Television	198	11	187	5.6	4	36.4	182	16	0	8.1
Scientific Institution	130	34	96	26.2	20	58.8	122	7	1	5.4
User Generated Content	100	15	85	15.0	10	66.7	46	54	0	54.0
Non-scientific Institution	83	25	58	30.1	19	76.0	71	10	2	12.0
Company	50	7	43	14.0	4	57.1	40	9	1	18.0
Other	27	2	25	7.4	0	0	21	5	1	18.5
Total	**826**	**114**	**712**		**62**		**696**	**123**	**7**	

If the narration in online science videos in our sample can be characterised by anything, it is the almost universal dearth of the use of storytelling to convey the science. Only 44 of the 826 videos (5.3%) used storytelling techniques, with the rest relying upon exposition of the science. The low use of storytelling was apparent irrespective of the subject matter ($\chi^2 = 4.11$, df = 2, $P > 0.1$) (Table 2).

Table 2. Use of Storytelling, trying to Persuade, and Talking Directly to the Viewer in Online Science Videos according to the Topic.

Topic	**Videos**	**Storytelling**		**Persuasion**		**Talk to Viewer**	
		Yes	No	Yes	No	Yes	No
Climate Change	300	11	289	81	219	77	223
Vaccines	268	20	248	98	170	42	226
Nanotechnology	258	13	245	20	238	44	214
Total	**826**	**44**	**782**	**199**	**627**	**163**	**663**

Similarly, there was a low use of interactivity in the online science videos with only 75 (9.1%) having any form of interactivity at all and, even then, in 70 of those (93.3%) the degree of interactivity was low.

Visual techniques that might help engage viewers also occurred at low levels: time-lapse was used in 80 (9.7%) of the videos, slow motion in only 28 (3.4%), and stop motion was used in just 28 (3.4%) too.

More than a third of all the science videos (n = 281) attempted to persuade the viewer to accept a proposition based upon the science presented. The likelihood that videos tried to persuade the viewer was significantly influenced by the topic ($\chi^2 = 61.86$, df = 2, $P << 0.001$), with those about vaccines and climate change being more likely to try to persuade (36.6% and 27.0%, respectively) than those about nanotechnology (7.8%) (Table 2). While the likelihood of the narration in the videos talking directly to the viewer did vary by subject matter ($\chi^2 = 10.63$, df = 2, $P < 0.005$), this was not related to their attempts to persuade, with similar percentages of videos about vaccines (15.7%) and nanotechnology (17.1%) talking directly to the viewer. By contrast, the narrator in 25.7% of videos about climate change spoke directly to the viewer (Table 2).

Discussion

Our review of narratives in 826 science online videos covering the topics of climate change, vaccines, and nanotechnology showed that, as popular as online videos have become, and despite their potential for interactivity as promised by Web 2.0, most adopt an expository form of narration, a style that has been the hallmark of science films for nearly a century (Nichols 2001, León 2007). Interactivity on YouTube and other online video platforms occurs primarily between viewers, through sharing and commenting (Mier and Porto-Renó 2009), not the type of interactive narratives that have been predicted to evolve in the age of the internet (Page and Thomas 2011, Koenitz and Knoller 2017).

In fact, despite the volume and popularity of online videos about science, the exciting new developments in narrative that were predicted to arise on the web have, for the most part, failed to materialize, with the bulk of online science videos being simply expositions with respect to their narratives. Two trends did emerge that represent an alteration of narrative in the digital age: (i) the lack of storytelling and (ii) the increasing prominence of informal narratives.

Perhaps the most startling finding from our study is that only 5% of online science videos, irrespective of who produced them, use a traditional story structure. Stories typically follow a

three-act structure with a beginning that introduces an issue or situation, a middle that provides a complication and jeopardy, and an end that resolves the issue or situation (McKee 1997). Storytelling has been shown repeatedly to enhance engagement and learning in films (McKee 1997, Xhemaili 2013), both of which are likely to be the primary aims of science videos.

User generated content in our study – the fastest growing category of online media (Anonymous 2015, Walgrove 2015) – was notable for its informal approach. While informal narratives were a feature of only 15% of the science videos in this sample, more than half of all the user generated videos were informal in style. As the move to online live broadcasting and user generated content gathers momentum, that trend is only likely to strengthen. Like the lack of storytelling, this does not necessarily bode well for improving the communication of science in the online arena. The *ad hoc* and unstructured nature of these informal narratives means that the information is often not delivered in the logical manner characteristic of a formal exposition to aid comprehension, and even the information itself may be unreliable (Kuhn 2015). There is an argument, though, that the informality of user generated content is one of its greatest appeals (Lobato et al 2011) even if the viewer may misinterpret its trustworthiness (Kuhn 2015).

Rather than the engaging media-rich, interactive, collaboratively-generated content predicted by theorists, it seems that in the online digital environment, storytelling and narrative are being subjugated for the expediency of informal expositions.

Expediency is also apparent in the low use of cinematic aids known to enhance viewer engagement and interest in traditional filmmaking. Part of this might reflect the inexperience and unsophisticated filmmaking abilities of many online producers, but it is also bound to reflect the lack of a really effective business model to monetise content (Babirat and Davis 2008). Certainly time-lapse and stop motion are more expensive to produce by virtue of the time taken to film and process them; and slow motion requires capable and hitherto expensive cameras. The advent of slow motion and time-lapse capabilities in relatively cheap cameras, including smart phones, suggests that these visual aids to narrative could become much more prevalent in online science videos in the future. Nevertheless, the inescapable conclusion is that in the move to consume videos about science online, the viewer is paying a price: little storytelling, less structured presentation of information and few special effects.

On the other hand, one of the major revelations about online videos, and their appeal to younger generations especially, is that the technical quality of the product, including its narrative quality, is not a major determinant of the number of views a video might get (Finkler in prep). According to Deloitte's Digital Democracy Survey of 22 April 2015, those aged 14-25 already spend more time watching online videos than television, and those aged 26-31 are not far behind (Walgrove 2015). A characteristic of user generated content is that it is often "amateurish" (Burgess and Green 2009). Indeed, videos that go viral are typically not characterised by their professional quality but rather their "emotion" and "authenticity" (Berger 2013, Finkler in prep). The less-than-polished production values of user generated content equate with authenticity for the viewer, while emotion is often derived from a narrative delivered in an informal, unscripted, even quirky, manner. Indeed, this may be the secret sauce to making science videos attractive online and one reason why marketers are scrambling to emulate the characteristics of user generated content (Anonymous 2015).

Science is a difficult product to market. On one level, it can be highly complex and technical, and yet it has an integral and inescapable influence in our lives. Above all else, science is about facts and uncovering the truth. As a consequence, in traditional science documentaries there is considerable cachet given to science films produced by trusted sources, such as the BBC (León 2007). Yet, as the 826 videos in our sample reveal, a considerable proportion of science presented in online videos has an agenda: they attempt to persuade and, therefore, the notion of the science presented being the unbiased truth is a harder claim to uphold. This is particularly so for controversial topics, such as the causes of climate change and whether to get vaccines. It is in this area that informal expositions – especially those that address the viewer directly – are likely to be of the most disservice for viewers and, at times, even dangerous. In this age of "fake news" and "post truth" politics, the viewer is going to have a hard time deciding where the truth lies in what is presented as science on the web.

The one positive for viewers is that producers of online science videos largely eschew jargon, with the notable exception of those videos emanating from scientific and non-scientific institutions. This may reflect the lack of experience that these institutions have with using this medium for mass communication: traditional producers of video (e.g. television and online newspapers) seem to have already learnt the lesson that jargon obfuscates comprehension. Institutions, such as non-profit organizations, use YouTube videos mainly to inform and educate viewers about their missions, programmes, and services (Waters and Jones 2011), and, as a

consequence, tend to utilize expository styles of narration that can be easily infiltrated with jargon.

In sum, the current state of narratives in online videos about science might be considered largely discouraging. However, it suggests there is a golden opportunity for producers to employ storytelling, engaging presenters and sophisticated production techniques, combined with fact-checking (Bortoliero 2015), to ensure that the science is presented in as engaging and as accurate a manner as possible. But, who will pay for that? Without a means of monetising the investment required to do that, there will be little incentive to do so.

The advent of cheap cameras and editing equipment, but particularly YouTube for distribution, has led to the democratization of the filmmaking process: anyone can do it and potentially reach anyone else (Babirat and Davis 2008). But that comes at a price: amateurish productions that do not leverage the multi-layered sophisticated narrations the internet could potentially deliver – and which we were promised (Page and Thomas 2011). In a sense, it is a variation on Garret Hardin's tragedy of the commons (Hardin 1968): the digital space – in a similar manner to physical environments – is driven to a state governed not by what is best for the common good but what serves individual self-interest. Making the best videos for communicating science may benefit us all, but the digital landscape will tend to be dominated by tactics that enable producers to survive. In such a scenario, high quantity and low quality will almost always trounce high quality and low quantity.

In conclusion, we may very well live in the age of the viewer, but that doesn't necessarily make for better communication.

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