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Genre: Academic essay

Purpose: The purpose of this paper was to convince people to trust scientific research.

Audience: The target audience of this paper was academic scholars.

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ENGL 5106

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Science and its trustworthiness are ~~is~~ often debated across social media platforms. The current narrative is that science is untrustworthy. Social media plays a huge role in today's society when it comes to science communication. Many people receive their news from social media alone. Statistics show that 49% of U.S. adults use social media as a source of news (Xiao, et al.). Of the people who use social media as their news source, many of those users rely on it as their primary source of news~~that is their primary source of news~~. This is not hard to believe, as it is the most convenient way to receive information since most people have their phones in-hand at any point during the day and news is just a click away. However, this can also be dangerous, as social media is not only used to share scientific information, but also to spread science misinformation (Huber, et al.). This has been an inherent problem as of late, particularly with the COVID 19 outbreak and its spread~~ at the head~~. Social media is used by individuals or groups to negatively influence public opinion about the COVID 19 vaccine, ~~ose vaccinations, amongst~~ other vaccinationss, and climate change. According to Xiao, et al., the relationship between social media news and conspiracy beliefs is at an all-time high. Social media news was found to

Commented [GL1]: Should be "are" since "science and trustworthiness" are plural.

Commented [GL2]: This sentence is a bit hard to read, maybe reword a little bit.

Commented [GL3]: Looks like "is" could go here and an "s" could be added to "new."

Commented [GL4]: Maybe look at finding another way to say this since the reader might not understand without a statement saying whose "head."

Commented [GL5]: Looks like we're trying to say "COVID and other vaccination" so maybe reword slightly for clarity.

be a significant moderator in that relationship. That misinformation led to distrust in actual news outlets. People must understand that uncertainty in science is prominent to some degree ~~in science~~ and it will never go away.~~anywhere.~~ It's a necessary part of the research process and for anyone to challenge professionals in the field because of those uncertainties, it goes to show that they don't really know anything about science communication.

Despite the many scientific journals and news outlets and the fact that they are~~it is~~ still a prominent source for scientific articles, people still choose to believe ~~listen to and take~~ the word of people with no credentials and people who have no real sources. Conspiracy theories and opinion pieces have become popular. Some might say those types of stories are even more popular than the true stories backed by scientific facts. Conspiracy beliefs are dangerous to an extent because ~~seeing as~~ those beliefs can prevent people from gathering the correct information that could potentially save their lives. It also can prevent individuals from establishing positive intentions and behaviors (Xiao, et al.). Scientists have tried reaching readers and ~~/~~viewers on social media in order to counteract other posts. Social networking sites like Twitter and Facebook have added fact checking features to posts that could be potentially controversial.~~also worked to make it obvious that certain posts are not accurate by adding a fact checking feature to posts that could potentially be controversial.~~

The growing importance of social media when receiving scientific information has made people ask questions like "Is this information really trustworthy?" Some say that social media has negatively impacted the public's trust in science. The conspiracy theories found on the many different social media platforms are rampant and are behind many of the decisions people make regarding their health; specifically, vaccinations. People's distrust in science can negatively affect scientific research and society as a whole.~~Scientific research and society as a whole can be~~

Commented [GL6]: Maybe use "away" or restate to something like "prominent to some degree" for clarity.

Commented [GL7]: What is "it" here, since we already mentioned journals and news? I think we are referencing them both here, so maybe change this to "they are".

Commented [GL8]: Could probably use "believe" to sum this up a little.

Commented [GL9]: Maybe use "because" here for clarity.

Commented [GL10]: This sentence could be shortened a bit and the subject and verb could be closer together for clarity (twitter and facebook are subjects and adding is the action they're doing.)

~~negatively affected by people's distrust in science.~~ Xiao, et al. found that individuals who goet most of their news from social media sites not only had greater general conspiracy beliefs, but also more conspiracy beliefs related to COVID-19 during the pandemic. According to Huber, et al., the declining trust in science could diminish the willingness to participate in those projects as well as decrease the public's willingness to donate funds as well ~~to~~ because they might find it wasteful. Scientific knowledge is a crucial part of politics as well. That knowledge goes into the decision making for politicians.

There are many reasons why social media news has a better relationship with trust in science than traditional or online news outlets. Social media expands its information networks. Readers are not bound to just one site and they're able to compare and contrast different sites almost immediately. Also, social media is updated and available 24 hours a day, increasing the chance of viewers coming across science news more easily than typical news outlets~~Social media users also have a greater chance of coming across science news than others because other news outlets are only available certain times a day, whereas social media is updated and available for viewing 24 hours a day~~. Social media users are exposed to science news even when they are avoiding it~~not trying to be~~. This is referred to as incidental exposure (Huber, et al.). The multiple social media sites available to users also foster a greater sense of trust in science within the population. People engage more with the news posted by people they trust whether that be a family member, friend, or even co-worker. Those people have similar opinions, which in turn, makes them trust the information more.

There are different types of uncertainty. Making distinctions amongst those uncertainties is necessary for conceptual clarity, theoretical understanding, methodological consistency, and predicting audience response (Gustafson and Rice). The different types of uncertainty include

Commented [GL11]: This sentence is passive voice and could be reformatted to active voice.

Commented [GL12]: Should be "got" since we're saying they "found" which is past tense, also could use revision as it's also passive voice.

Commented [GL13]: Could have meant "too" as in the phrase "as well."

Commented [GL14]: This sentence is long, could revise to make it shorter.

Commented [GL15]: This may be summed up with fewer words to make it clearer.

deficient, technical, consensus, and scientific doubts. Deficient uncertainty is when there is a known gap in the knowledge portrayed. Those ~~unknowns~~ unknown gaps can be caused by a lack of research on a topic, the fact that the answer can never really be known, and even because the problem space has grown. Technical uncertainty occurs when science displays the uncertainty as a range, a probability, or an estimate. Consensus uncertainty is the ambiguity~~uncertainty~~ of a particular finding, theory, or prediction that can also be described in terms of the discord or ~~/~~accord that exists about it. Lastly, scientific uncertainty is described as the "~~"~~unknown unknown", meaning we cannot escape the fact that in the future, our current understandings regarding a topic may change in ways that are unknown right now (Gustafson and Rice).

The uncertainty of a person's trust in science communication starts to exist when the information is complex, unpredictable, and ambiguous. When information is inconsistent, it leads to insecurities in the readers and viewers. That leads to anger and sometimes that leads to people going on long rants filled with untruths and their own wild conspiracy theories. Uncertainty can also cause people to make~~justify people's~~ decisions to continue on with their rants and conspiracies. It gives them confidence that professionals don't really know what they are talking about ~~and~~ or haven't done the proper research. In the case of the sciences, this is usually not true considering much research and testing ~~s~~ are required ~~to be~~before ~~done prior to~~ disclosing information. People tend to expect scientists to know more than the masses. However, this is dangerous due to the huge role uncertainty plays in science (Gustafson and Rice). Hypotheses must be made before one can begin running tests. Those hypotheses are not always right. That's why the tests are conducted in the first place. Uncertainty; however, is not always negative. This is something people need to understand. When scientists communicate their uncertainties about imminent threats and threat severity, it increases ~~d~~ the desired behaviors of

Commented [GL16]: Maybe change to "unknown gaps" to make it clearer what is being referenced from the sentence in front of it.

Commented [GL17]: The word "uncertainty" was used several times, making the sentence unclear. Try and synonym to avoid sounding repetitive.

Commented [GL18]: This could be confusing because a reader might think it's a typo or grammatical error. Putting quotes around it helps show it's a term someone else used to describe that uncertainty.

Commented [GL19]: Maybe a different word here because otherwise it sounds like it is a valid reason. Maybe "fuel" or reword to "cause people to make decisions…"

Commented [GL20]: I see and/or in writing sometimes, but I think that in a genre like this it should be simply "or".

Commented [GL21]: Should be "testing" to agree with "research". Change of wording for "before done prior to" also makes it more concise.

Commented [GL22]: Should be "increases" because the rest of the sentence is in the present tense and this is past tense.

people (Gustafson and Rice). The many competing views of the public's preferences influence how the media delivers uncertain science (Ratcliffe and Wicke).

Learning how to portray uncertain science to the public remains a goal for science communication. However, despite earlier findings that uncertain science could negatively impact readers' and viewers' opinions alike, news credibility and science objectivity ratings were higher for uncertainty disclosure (Ratcliffe and Wicke). It seems that now, more people prefer their information to come from scientists who make their viewers and readers aware that they are uncertain about an issue. Apparently, it has been found that it makes them more trustworthy. Viewers and readers also claim that scientists who are clear about uncertainties appeared to be more balanced and the news article more credible (Ratcliffe and Wicke). Journalists are at the centerr al inof translating scientific research to the public. Without proper training and education, it is easier for people on social media to misinterpret findings and relay the wrong message to readers.

~~It is easier for the people that get on social media who try translating scientific findings without the proper training and education to misinterpret findings and relay the wrong message to readers~~. One's translation of science findings could greatly influence the public's beliefs about scientists as well as issues in science.

Facebook and Twitter are not the only social media platforms that deliver news. YouTube has become one of the largest sites on the internet and it has become a growing way for people to discover the sciences (Welbourne and Grant). On YouTube, viewers encounter various communication styles. Science communication is now conducted ~~not only~~ by professional communicators, and ~~but~~ also by scientists, interest groups, professional organizations, and passionate amateurs. Viewers have gone from being passive consumers to active participants (Welbourne and Grant). With that being said, the different types of communication are pertinent

Commented [GL23]: Just a typo- add the "d" to get it fixed.

Commented [GL24]: A word may have been left out here by accident? Maybe reword it to "Journalists are at the center of" or maybe it should have been "Journalists are central to".

Commented [GL25]: This could be a bit more concise to help with clarity. Probably just needs some words moved around.

Commented [GL26]: This sound like a statement saying that it definitely happened or is happening. Putting "could" in here makes it a bit more flexible while also stating the problem.

Commented [GL27]: "Not only" could be cut here and after the comma change to "and also by" to get the same thing, but with less words.

in any scientific news information. Humor, aggression, and a combination of both communication styles can be found in any YouTube video. These styles are commonly observed in discussions over controversial science issues (Yuan and Lu). Those ~~different communication~~various communication styles are all received differently and people's reception of those styles greatly influence their willingness to accept the information. Aggressive styles of communication use language to deviate from a neutral position and demean anyone who disagrees with the communicator's opinion (Yuan and Lu). People who use the aggressive technique humiliate their competitors and initiates bullying. Despite the controversy with this communication style, it has been found to be more entertaining, more engaging, and of higher quality as long as it does not violate the audience's expectations (Yuan and Lu). Humorous styles are often exempted from the talk of communication styles. Though it can be used to help increase pro-environmental behavioral intentions, it often results in a decrease in message informativeness (Yuan and Lu). A type of humor used in social media news is affiliative humor. This is a type of humor that elicits laughter and other forms of amusement from viewers in order to reduce tension and conflict. Though humor is typically affiliated with happiness, aggressive humor is also a concern~~thing~~. That is any humor that derogates or provides negative information about something or someone. Types of aggressive humor include satire, sarcasm, and even mockery.

The type of YouTube channel a content creator has also plays a part in information reporting~~everything.~~ User-generated channels don't typically have the large following that large, professionally generated channels have. This is important because most studies examining science communication on YouTube are directed at assessing the veracity of the information. The topic influences video popularity (Welbourne and Grant). Once the topic grasps the viewers'

Commented [GL28]: Because the word "differently" follows pretty close, it may make the sentence flow better to use a synonym like "various."

Commented [GL29]: It might be a good idea to put the word "styles" in here so that people know what is being a big influence. Otherwise, they might think it references "reception" since that's nearby.

Commented [GL30]: This part is a bit vague. Maybe just change "thing" to "concern." That way the audience knows it exists, but in a way that contradicts the positive of typical humor.

Commented [GL31]: This is a bit vague. Since we're talking about information reporting, that would probably be a good thing to plug in here to remind the audience about the overall topic this relates to.

attention, it is up to the content creator to keep their attention. The creator has a variety of communication styles to choose from and they typically make their decision depending on their audience. Most creators know who their viewers are, so they like to play on their emotions, thus playing into their fears or desireslove ~~of something~~. Since social media makes the world so much more information-rich, gaining the readers' and viewers' attention is dire. Below is a chart that compares professional- and user-generated YouTube channels. The difference in the numbers is quite apparent. Though professionally ~~-~~generated channels post more often, it's the user-generated channels that receive all the views and subscriptions. There is a large gap in the two and they can't really compare.

Commented [GL32]: This is vague sounding and wordy. Maybe just change it to "desires" to sum it up better.

Commented [GL33]: Add a dash in here to make these two words work together in describing "channels."

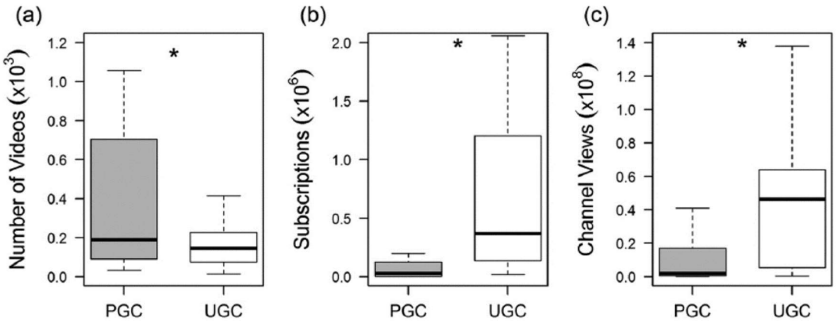

Figure 1. The number of (a) videos, (b) subscriptions and (c) channel views of professionally generated (PGC) and user-generated (UGC) YouTube science channels. Asterisks indicate a significant ($p < .05$) difference between PGC and UGC.

When everyday ~~normal~~ people try to deliver science news to the public, it's called citizen science. Some people compare citizen science to the movement to democratize science (Bonney et al.). According to Alan Irwin's book, *Citizen Science: A Student of People, Expertise, and Sustainable Development,* the goal of citizen science is to bring the public and science together

Commented [GL34]: This can sound vague because the reader may not understand what it's meant to say. Maybe by using something like "everyday", it tells the viewer we mean the typical person as opposed to a formal reporter.

to consider possibilities for a more active scientific citizenship and to involve the public more deeply in dialogue and decision-making around issues related to risk and environmental threat (Bonney et al.). More plainly put, citizen science is the public's participation in scientific research. There are four categories that citizen science can fall into. They include data collection projects, data processing projects, curriculum-based projects, and community science projects. Curriculum based projects can include both data collection and data processing. Community science day usually involves participants in data collection. The way people engage within these categories is significantly different. Volunteers collect the data in citizen science. They may or may not have formal training.

People react to each form of communication differently. Those reactions affect decisions about how people react to the message, which is an "affective perspective" (Yuan and Lu). Psychological reactance is a threat to the sciences because it contributes to the rejection of messages and is negatively associated with people's attitudes towards a topic. Psychological reassurance is what happens when a freedom is eliminated or threatened to be eliminated and it includes two dimensions- an effective response like anger, and a cognitive response that covers both positive and negative thoughts (Yuan and Lu). When social media news posting exert influence that makes it hard for people to make their own decisions about a topic, it becomes extremely dangerous.~~the communicative properties in a social media news posting forces on people that make it difficult to make their own decisions about a topic, it becomes more than dangerous.~~ According to Yuan and Lu, messages that are a~~A~~ggressive and humorous ~~messages~~ can influence psychological reactance by altering~~affecting~~ how ~~people's~~ aggressive ~~ness~~ or~~and~~ humorousness the~~of a~~ message is perceived to be (Yuan and Lu).

Commented [GL35]: I think this was just a typo that probably meant to say "The way."

Commented [GL36]: Could have been a little unclear to the reader that the "affective perspective" being used at the end wasn't a restatement of what was earlier in the sentence, but a quote from the research. By putting quotes around that and adding "an" it makes that into someone else's term.

Commented [GL37]: Could use a bit of rearranging for clarity.

Commented [GL38]: Forms of "aggressive" and "humor" are used in a few places, making the sentence a bit repetitive and a little unclear. Restructure a bit for clarity.

Advertising on large platforms is also important for science communication. That advertising gives the scientific piece an advantage. When advertised, it would be pertinent to advertise the piece as a light read or quick video footage. Long, slow-paced pieces tend to deter readers and viewers. This negatively ~~a~~effects scientific pieces that have the proof and necessary information people need in order to be better informed. In 2012, the Pew research Center found that of the most viewed videos between January 2011 and March 2012, 20% were less than to minute long and 82% were less than five minutes long (Welbourne and Grant).

Though it can be fake, people's trust in social media news has been growing rapidly. This can be due to several reasons. One ~~of those~~ reason~~s~~ could be the fact that people prefer to interact ~~more~~ with and trust people with whom they are familiar and have similar views~~people who have similar perceptions as them~~. Posts on social media are ~~is~~ also able to reach a broader range of people. That heightened exposure fosters a greater trust in that science (Huber, et al.). As a result of those findings, universities and scientific research companies have started relying more on social media to post their findings so that they too can reach the masses. That news is received directly from experts, rather than the user being responsible for researching and locating journals with the information they seek. ~~That news is received directly from experts rather than having to do your own research and find journals that possess the information you are seeking~~. People prefer that information to come from the experts rather than journalists because it is more trustworthy and more precise (Hubert, et. al).

Scientists can choose to post on social media in order to best get their information to the general public. The Association for the Sciences of Limnology and Oceanography issued a chart in order to help guide scientists on their social media journey. The table breaks down some of the most common social media platforms and gives pointers on when and how to post as well as the

Commented [GL39]: A little unclear here because "that" could be referring to the science information, when I think we're talking about the advertising instead. Add a word here to indicate what "that" is.

Commented [GL40]: Change to "affects" since we're talking about how the negativity influences the piece.

Commented [GL41]: This is a little hard to read because of all the "ands" used. Rephrase to make it more concise.

Commented [GL42]: Change "is" to "are" because posts is plural, so that needs to be plural as well.

Commented [GL43]: With this sentence, it's a bit long so maybe just a bit of rearranging to make it clearer. Also- before now we were talking about "people" and here we're talking directly to them using "you" so it will need to be worded a bit different there.

pros and cons of each. Part of that chart is below. The full chart can be found here:

https://www.aslo.org/science-communication/scientist-guide-to-social-media/

Platform	Description	Your Goal	Time Commitment	Pros	Cons
Twitter	Social networking site for 140-character messages (a.k.a. tweets). On twitter, you can "follow" the tweets of your friends, colleagues, and even those of strangers and celebrities.	To send messages or publicize content in 140 characters or less. To stay up to date with the news, discussions, and issues in your field and join in fast, pithy conversations.	Medium; Aim to tweet almost every day to keep your account active. Serious twitter users will tweet multiple times a day.	An easy way to connect with diverse people in your field; the ability to share info and follow news in real time.	Fast pace can be overwhelming. Tweets can get 'lost' in the crowd.
Facebook	Social networking site that allows you to post photos, videos, links, and messages to your profile. Pages can be created by lab or research groups and followed by anyone.	To share relevant links and information that your audience is interested in.	Low; Post links or original content a few times a week.	Familiar platform for most people; a large (theoretical) audience. A Facebook page for a lab group can let you reach people without using your personal account.	Takes a lot of work to reach people outside of your ~~facebook~~Facebook "friends," so reaching a wider audience can be difficult.

Commented [GL44]: Looks like "to" got left out from here.

Commented [GL45]: Capitalize where needed so that the name is spelled the way the company spells it.

By examining the changing habits of news outlets, social media, and people over the last few years, we can better understand how unsafe it is to receive our news from social media alone and why it is unsafe to take the word of people who have no scientific background. This will help people understand that though it is important to make our own decisions when it comes to trusting the news or other outlets, it is equally important that we take all things into account. That includes and goes beyond the work of videographers, the content, research, and wording in blogs and articles. ~~Those include, but are not limited to, the behaviors of videographers, the wording in blogs and articles, as well as the research behind those articles~~. It is also important that we know not to always take the word of scientists as fact. We must do our own research no matter where the information comes from and then make our decision regarding whether or not we will trust the information. Uncertainty in science is a necessary and inherent part of the process and can never be removed altogether. ~~will never go away. It is a part of the process and will never go away.~~

Commented [GL46]: The sentence is clear, but it stops and starts due to the things that come in the middle. Might benefit from a rewrite that tries to minimize or put the parts in the middle at the end or beginning of the sentence.

Commented [GL47]: This sentence sort of repeats what was in the sentence before it. Might just combine the two and reword it a little bit.

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