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Curbing the Spread of Disinformation Through User Interface Design

Mary Margaret Herring

A departmental senior thesis submitted to the
Department of Communication at Trinity University
in partial fulfillment of the requirements for graduation with
departmental honors.

April 28, 2020

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Curbing the Spread of Disinformation Through User Interface Design

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Honors Thesis

Abstract

Solutions to the problem of the spread of disinformation have come from a variety of disciplines. However, little academic research has examined the whether or not the user interface design of social media platforms could affect the spread of disinformation. Drawing from research from the uses and gratifications paradigm and technological affordances, this study examines user behavior on three versions of a researcher-created news sharing social networking service, called *The Hive*. Findings were inconclusive about the modifications tested in this study but nevertheless revealed interesting patterns in user behavior. This project, by closely examining the relationship between user interface design and user behavior, sheds new light on the problem of disinformation by arguing that users can be prompted to be more active consumers of news through changes in the interface.

Keywords: disinformation, user interface design, social media, user behavior

Introduction

The democratization of technology has transformed the way that users interact with news media. With the help of social networking sites (SNSs), citizen journalists can publish op-eds on Facebook, livestream and document events in their communities, and become political activists on Twitter. Aside from creating news, many adults use SNSs like Facebook, Twitter, or YouTube to stay informed. Shearer and Matsa (2018) found that two-thirds of American adults get at least some of their news online and Shearer and Greico (2019) determined that 52% of all American adults get their news from Facebook. Social media is also used as a news source abroad. A 2018 study conducted by Mitchell, Simmons, Matsa, and Silver found that globally, 35% of people get their daily news from social media. With the lines becoming blurred between professional- and citizen- journalism, however, it can be difficult for the masses of SNSs users to separate fact from fiction. Other kinds of informational posts – such as ads from politicians or news organizations – also compete for space in the news feed. Together, all of this content can make it difficult for concerned citizens to make sense of their news feed.

The rise of SNSs has seemed to accelerate the spread of disinformation, or false news written with the intent to deceive. In the midst of the COVID-19 pandemic, Dr. Tedros Adhanom Ghebreyesus (2020), general-director of the World Health Organization stated, “[b]ut we’re not just fighting an epidemic; we’re fighting an infodemic.” The progressive activist group, AVAAZ (2020) found that pieces of pandemic-related misinformation were shared over 1.7 million times and were seen about 117 million times on Facebook alone. While 31% of social media users reported that they are wary of the accuracy of news on social media (Shearer & Matsa 2018), the emotion evoking titles of false news stories may encourage users to click on them. A massive study conducted by Vosoughi, Roy, and Aral (2018) demonstrated that people

were 70% more likely to retweet false information than true information. Vosoughi et al. found that false posts inspired feelings of surprise, novelty, and disgust in the reader, possibly encouraging the user to share the story.

Slowing the spread of disinformation is a complex problem that will likely require attention from disciplines ranging from computer science to sociology. For example, Pennycook and Rand (2019a) have proposed using an algorithm to place news from suspicious sources lower in the news feed. Others argue that media literacy education can play an invaluable role in preventing the spread of false information (e.g. Delwiche & Herring, forthcoming). These two examples alone are not representative of the vast amount of work being done to combat the spread of fake news. Amongst all of this work, however, there is a lack of research on the way that users interact with the interface, or design of the platform. For instance, are people more likely to read a news story before sharing it if there is a “read article” button? Will users spend more time looking at posts if they are shown a limited number of posts rather than an infinite stream? While social media companies employ user interface researchers to keep users on their platform, there is a lack of research about whether it could be used in the opposite way – to deter users from sharing disinformation.

Literature Review

1. *Uses and Gratifications*

Uses and gratifications theorists view the audience as being composed of active individuals rather than passive consumers of media messages (Rubin, 2009). As such, research in the uses and gratifications tradition reveals the motivations for using different types of media or messages. In a comprehensive study of uses and gratifications research, Katz, Blumler, and Gurevitch (1973) found five underlying assumptions of this model: (1) the

audience is viewed as active, (2) the audience is able to make choices to gratify their needs, (3) the media competes with alternative sources of need fulfillment, (4) individuals can report their thoughts and motives, and (5) value judgments should be withheld (p. 511). Rubin usefully summarizes the uses and gratifications approach by writing that it “underscores the role of social and psychological elements in mitigating mechanistic effects and sees mediated communication as being socially and psychologically constrained” (2009, p. 165).

People use media for a variety of reasons: to stay informed, pass time, or make connections with others about a shared interest. While many uses and gratification studies develop a typology of different media uses and gratifications suited to their own purposes, McQuail, Blumler, and Brown (1976) have created a widely used typology. They categorize media uses into four categories: diversion, or “escaping from” something such as a monotonous life; personal relationships, or the formation of relationships with other consumers or media personalities; personal identity, or the way that the viewers orient themselves in the world; and surveillance, or exposure to different ideas or events (McQuail et al., 1976). Scholars have examined the uses and gratifications of consumers of a number of different media. While researchers create their own typologies to explain the results of their studies, many categories are rooted in the breakdown presented by McQuail et al. (1976).

Long before the rise of the internet, Lazarsfeld (1940), Herzog (1940), and Berelson (1949) pioneered research in this field with studies on why people listen to the radio, quiz-shows on the radio, and read the newspaper, respectively. While these three studies focus on the uses and gratifications, Katz et. al found that uses and gratifications research has also been conducted on the material, message, or audience’s culture (1973, p. 512). Since the 1940s when the first uses and gratifications studies were published, there has been an enormous amount of

technological innovation. This innovation has transformed the ways that audiences interact with media. Sparked by the democratization of media brought about by the internet, audiences are no longer only able to consume media but also actively create and shape the information environment that they, and others, see. The uses and gratification paradigm has been applied to these new forms of media, like SNSs.

1.1 Uses and Gratifications of Facebook.

As a large platform that serves a number of functions, people use Facebook for a number of reasons. Whiting and Williams (2013) found that the leading motivation for people to use Facebook was as a source of social interaction. Other studies have confirmed that people use SNSs to build social relationships, but have found that there are other salient features of the site that lead to increased likelihood to interact. For instance, Smock et al. (2011) found that users were generally motivated to use Facebook as a source of expressive information sharing. Aside from using Facebook as a source of social interaction, Papacharissi and Mendelson (2011) found that people also use Facebook to find and share information. Whether a user turns to Facebook to make sure that they haven't forgotten their friend's birthday or wants to let their friends know about how great the concert was, Facebook is rife with information. Like a past version of the company's mission statement, users are motivated to use the site because it makes "the world more open and connected" (Newton, 2017).

Several studies have also argued that the most salient use of Facebook is as a form of relaxing entertainment (Smock et al., 2011). In a study of the uses and gratifications of Taiwanese Facebook users, Alhabash et al. (2014) determined that people who use Facebook as a source of entertainment had the greatest motivation to use the site and interacted with it with the greatest intensity. The seemingly unending stream of content displayed in users' news

feeds provides an entertaining way for people to form and maintain social connections. Yet, despite being a platform that encourages user interaction at nearly every turn, Papacharissi and Mendelson's (2011) study found that salient uses of SNSs are often ritualistic and passive. SNS companies have engineered habit-forming products that keep users coming back after feeling even the slightest twinge of boredom.

1.2. Uses and Gratifications of Political Information.

But, what motivates 67% of the American population to get news from SNSs like Facebook, Twitter, and Instagram (Shearer and Matsa, 2018)? Wohn and Ahmadi (2019) found that users were motivated to read micro-news stories, or brief snippets of news stories that appear in the news feed, as a form of entertainment or pass-time and as a form of social utility. In this context, social utility refers to experience that can be used to form social connections such as having knowledge of a news event when it arises in conversation. Segado-Boj et al. (2019) found that news consumption on SNSs is guided by informational rewards, or the feeling of excitement that arises after finding an interesting news story. Users are attracted to SNSs to quell boredom or stay informed and are gratified when they find a particularly interesting piece of information.

Yet, the stream of micro-news stories that are displayed in news feeds are not curated organically. On SNSs, a news feed is curated by the user's friend group and supplemented with suggestions from an algorithm. This highly personalized customization of stories has led to a phenomenon that Segado-Boj et al. (2019) call the "news-finds-me" perspective. However, the intense personalization of news displayed in news feeds did not increase the number of news stories that users share (Segado-Boj et al., 2019). Rather, Segado-Boj et al. (2019) agree with Hampton et al.'s (2014) findings that users were about twice as likely to contribute to

discussions if their social network would agree with their stance on the issue. This suggests that users are less likely to share a news story that they agree with if they perceive that their friends or followers will disagree. In a study of undergraduate students, the main factor that motivated users to share news stories was the feeling that the story was something that their followers should know about (Head et al., 2018). These findings suggest that a user's self-presentation on SNSs guides the content that they choose to share with their friends and followers.

Many factors can also predict whether or not a user will click on a link leading to a news article. Due to the varying topics covered in news on SNSs (e.g. Arts & Entertainment, Politics, DIY instructions, etc.), people visit SNSs to fulfill diverse information seeking needs (Wohn & Ahmadi, 2019). However, Wohn and Ahmadi (2019) found that perceived salience was the only factor that led users to click on a news story after viewing the snippet presented in the news feed. The source of the message also predicts whether or not a person clicks on the provided link. A study of link clicks on Twitter found that news articles shared by the organization who created the story were commonly clicked on. However, once retweeted or shared by other users, these links failed to generate interest – 60% of shared links were never clicked (Gabiolkov, Ramachandran, Chaintreau, & Legout, 2016). Yet, this finding seems to be at odds with a recent study conducted by Samuel-Arzan and Hayat (2019) who found that news was perceived as being more valuable if shared by a friend, rather than a news organization. This suggests that while a friend's news recommendation is perceived as being more valuable, it does not always lead the user to click on the post.

While examining the uses and gratifications of SNS platforms as a whole yields interesting results, some (Smock et al., 2011) argue that it is more beneficial to unbundle the

feature use of these multifunctional sites. Smock et al. argue that there are different affordances, or cues for interaction, offered to the user that shapes their interaction with the platform. For instance, a door knob is an affordance that cues the user to twist the knob to open the door while a handle is an affordance that cues the user to push or pull the door. The design of SNS platforms, like a door handle or knob, can cue the user to interact with the platform in a certain way. Perhaps by studying the affordances of different technologies, technology can be used to gratify certain behaviors – such as reading a post before sharing it.

2. *Social Media Design*

Uses and gratifications theories explain the function that people have for using SNSs. But, as Rubin states, “[m]edia uses and effects, then, depend on the potential for interaction...” (2009, p. 175). This implies that the potential for interaction plays a role in the way that the user understands and uses the medium. For example, while Twitter and Instagram are popular SNSs, the ways that they are used varies greatly. On Twitter, users are restricted by a character count and must keep their messages concise. Twitter users typically share brief updates about their lives, links to interesting news stories, videos, or images. But, the Twitter interface obviously looks different from Instagram’s interface. On Instagram, users are prompted to share images and captions. Where a Twitter user’s news feed is composed of text posts and multimedia, an Instagram user’s account is full of images and videos. The interfaces of these two SNSs are loaded with affordances, or “relationship[s] between the properties of an object and the capabilities of the agent that determine just how the object could possibly be used” (Norman, 2013, p. 11). For example, a light switch has properties that indicate to the user that it should be flipped while a knob has properties that indicate it should be turned. Affordances are signaled to the user via signifiers that direct the user to interact with the object in a certain

way (Norman, 2013). Examining the affordances and signifiers of SNSs will provide insight as to why and how people engage with the platforms in the manner that they do.

Sundar (2008) argues that technological affordances should be examined because they create cues that influence the ways users perceive and process content. To do this, he has adopted an affordance-based view that he calls the MAIN Model (Sundar, 2008). According to the MAIN Model, an affordance first conveys a cue that then triggers a heuristic, or mental shortcut (Sundar, 2008). On this theory, affordances are offered by the technology and facilitate certain actions (Sundar, 2008). He shares the example of a keyboard that facilitates typing. Cues simply trigger heuristics. For instance, the play button on a YouTube video triggers the knowledge that the content is a video rather than an image. Heuristics, according to Sundar, are “judgment rules that can result in estimations of content quality” (Sundar, 2008, p. 80). An example of a heuristic might be the act of judging a post to be factual because it has 3,000 likes. In the next step in this model, the user makes quality judgments about the platform. To illustrate this, Sundar (2008) uses the example of an e-commerce website that invites users to interact (the affordance) by asking the user if they would like to chat with a representative from the site (the cue). This triggers a heuristic (service, willingness to help) that then impacts the user’s perception of the site (Sundar, 2008).

Sundar (2008) proposes that there are four types of affordances that contain embedded cues: modality cues, agency cues, interactivity cues, and navigability cues. Modality cues pertain to the structure of the message and have historically been deeply connected to the message’s medium (Sundar, 2008). For instance, television programs present information visually and aurally while newspapers present information textually. However, the digitization of media has collapsed this strict divide. Now, the same information may be read, watched, or

listened to. Agency cues allow the user to locate the source of a message or interaction (Sundar, 2008). One heuristic that is triggered by agency cues is the identity heuristic (Sundar, 2008). Sundar writes, “[t]he *identity heuristic* is likely to be triggered whenever an affordance allows the user to assert his or her identity through the technology” (2008, p. 85). The ability to situate oneself within the technology will be important in later discussion of user interface design. Interactivity cues imply interaction and activity with the technology (Sundar, 2008, p. 85). An example of an interactivity cue might be a dialogue or text input box in a site. Finally, navigability cues, like menus, allow the user to understand how they can move around in the site.

Since Sundar’s (2008) MAIN Model is relatively new, little work has been done to test the model. In 2013, Sundar and Limperos argued that the cues produced by technologies in the MAIN Model will lead users to expect certain gratifications. Sundar and Limperos (2013) urged uses and gratifications researchers to adopt an affordance-based perspective for identifying gratifications from social media. Rathnayake and Winter (2018) used a revised version of Sundar and Limperos’s (2013) model to study social media uses and gratifications and suggested that more work of this nature should be conducted to determine what actions platforms gratify. For example, Rathnayake and Winter (2017) examined the uses and gratifications of dogmatic social media users. They found that politically dogmatic users enjoyed the ability to access content that resembles real-life situations and the enjoyment of media use on SNSs more than open minded users (Rathnayake & Winter, 2017). Based on this finding, the researchers concluded that existing SNS platforms currently gratify politically dogmatic users, but do not gratify open-minded users. As such, Rathnayake and Winter (2017)

argue that social media platforms should be redesigned in a way that also gratifies less-dogmatic social media users.

Since user interface designers work to manipulate user behavior, it is worth noting the ethical consequences of this work. In an interview with BBC, former Mozilla and Jawbone employee Aza Raskin stated “It's as if they're taking behavioral cocaine and just sprinkling it all over your interface and that's the thing that keeps you like coming back and back and back” (Andersson, 2018). While UX/UI designers typically work to increase sales or encourage users to click links, more sinister patterns can be implemented to trick users into performing actions that they do not want to. These patterns, called dark patterns, can be used to fool users into adding their email to a mailing list, entering their credit card information for a “free” trial, or pressuring users to add an item to their cart. User experience designer, Hila Yonatan (n.d.) states “[t]he area of ethics in user experience design lies on a scale that ranges from providing complete freedom to users, up to making all the decisions for them.” While tricking users into doing potentially harmful things seems clearly dubious, it seems morally questionable whether or not UI designers *ought to use* these patterns for good – like reducing technology addiction or encouraging critical thinking. Although this question is unclear, researchers and design ethicists have laid out guidelines to create humane technologies (e.g. Li & Literat, 2017; Center for Humane Technology, n.d.). These guidelines encourage ethical creation of technologies that put the users first.

3. Social Media Interface

3.1. Interface Design Based Solutions.

Research examining SNSs with the MAIN model suggests that users rely on affordances, or cues derived from the interface, to interpret how they should interact with the platform. This

suggests that altering elements in the interface could affect the way that users interact with SNSs. As McLuhan (1964) notably argued, “‘the medium is the message’ because it is the medium that shapes and controls the scale and form of human association and action” (p. 2). Perhaps altering the medium of the message will encourage users to interact with the content in different ways.

Proposals of this sort have already been made. Senator Josh Hawley recently sponsored the Social Media Addiction Reduction Technology Act (SMART) that aims to curb social media addiction by implementing design-based changes to SNS interfaces. The act, which aims “to prohibit social media companies from using practices that exploit human psychology or brain physiology” was introduced as a way to curb social media addiction (S. LYN19429, 2019, p. 1). If passed, Hawley’s bill would ban social media companies from using certain patterns - like gamification or infinite scrolling - that have been thought to promote social media addiction. This bill has been met with hesitation from user interface and user experience designers who urge lawmakers to consult designers before making these changes and has received push back from the tech companies who make a profit from these tactics (Lam, 2019). Before laws of this sort are enacted, research that manipulates design elements of interfaces is warranted to see how, and if, user behavior can be adjusted.

3.2. “Read” Button.

In a study of the emotional state of people while using SNSs, Panger (2018) found that users tended to wind down and experience lower arousal while using platforms like Twitter or Facebook. While passive scrolling might be suitable for other forms of entertainment, it seems that engaged users may be better able to distinguish veritable news from disinformation.

Pennycook and Rand (2019b) found that analytical users were less likely to share fake news

stories than more passive users. Further, a study conducted by Gabielkov et al. (2016) found that 59% of URLs shared on Twitter were never clicked – suggesting that the user shared the content without reading it. These findings indicate that the spread of disinformation may slow if users engage with the platform in a more active manner.

In their study of micro-news stories, Wohn and Ahmadi (2019) found that perceived salience was the only factor that predicted the user clicking on, or continuing to read, a news story. While it is difficult to persuade readers that a news story is relevant to them, it seems that adding a “read” button could encourage people to click on the link and read the story. Adding a view article button may act as both an interactivity and agency cue on Sundar’s (2008) MAIN Model. The presence of a view article button might act as a reminder that users are able to interact with the platform by clicking on the button. Similarly, the button might affirm that user’s choice to read the story and plays a role in the user’s perceived agency.

Calls to action buttons, or buttons that instruct the user to perform a certain action, have shown higher click through rates than other types of calls to action. A study conducted by marketing professional, Travis McGinnis (2019) found that call to action buttons had click through rates of 5.31% whereas designed calls to action messages, or more complex graphics with images or CSS formatting, only received an average click through rate of 3.53% and hyperlinked text calls to action had a click through rate of 2.06%. While the calls to actions examined in this study were from a variety of websites – not just SNSs – these results might be replicated in a social media setting.

H1. Adding a “read” call to action button will increase the number of times users click on the link to read the story before liking it.

H2. Adding a “read” call to action button will increase the number of times users click on the link to read the story before commenting on it.

H3. Adding a “read” call to action button will increase the number of times users click on the link to read the story before sharing it.

3.4 Warning Banners

Adding warning banners of different kinds to suspicious content has been tried by several SNS sites. In 2018, Facebook added warning messages to disinformation posts that had been debunked (Constine, 2018). These warnings backfired and users shared *more* false information (Constine, 2018). So, Facebook abandoned the warning messages and instead displayed relevant articles by more level-headed news sources. Similarly, in 2018, YouTube introduced information cues that display on conspiracy or false information videos and provided a link to a Wikipedia article on the topic to help point users to truthful information (Matsakis, 2018).

While there is little information as to whether or not these changes to the interfaces encouraged or discouraged clicking on the link or the warning banner (or Wikipedia link), Kim and Dennis (2019) found that indicating the source reputation rating of a story made users more skeptical of the post’s content when the source had a low rating. However, whether or not sources with a high rating affected users likelihood to believe the content was unclear (Kim & Dennis). Kim, Moravec, and Dennis repeated the study in 2019 using source ratings from expert fact checkers and SNS users and got similar results; “ratings affected believability, but only when sources were rated low: articles from low-rated sources were less believable – when the ratings were from experts or users evaluating articles – but articles from high-rated sources

were not more believable” (p. 958). Therefore, users are more likely to distrust articles with some form of warning about the credibility of content if the ratings of the content are low.

However, it is worth noting that users may be more likely to click on content with a warning message because of the novelty of the banner, as happened when Facebook implemented this strategy. While users may click on links with warning banners, it still seems unlikely that users will like or share content with the warning. It seems that further research as to how users respond to warning messages is warranted so that social media platforms might alert users of false news in the most effective way possible.

H4. Adding warning banners to false news stories will increase the number of times the link is clicked.

H5. Adding warning banners to false news stories will decrease the number of times the post is commented on.

H6. Adding warning banners to false news stories will decrease the number of times the post is reposted.

H7. Adding warning banners to false news stories will decrease the number of times the post is liked.

Methods

To conduct this study, a convenience sample of 44 people was recruited. The participants were recruited via an email asking for their participation. All participants were students from Trinity University, a small, private college in the Southwestern United States and were all aged 18 - 24. The sample was 81.2% female and 18.2% male. Of the 44, 36.4% of the sample majored in Communication, but the rest of the sample majored in a diversity of fields including STEM, business, and the humanities.

Politically, a majority of the sample (59.1%) identified as left-leaning. When asked about their political beliefs, 20.5% of respondents identified as liberal, 38.6% identified as somewhat liberal, 15.9% identified as “middle of the road,” 4.5% identified as somewhat conservative, 9.1% identified as conservative, 4.5% identified as non-binary, and 6.8% stated that the liberal/conservative spectrum was not a useful way to understand their political beliefs.

Participants in this study regularly check the news. When asked how often they look at the news or politics each week, 22.7% responded that they check the news constantly, 43.2% said they check the news often, 27.3% said they check the news occasionally, and 6.8% scarcely check the news.

The most popular SNS used for news or political information was Twitter. To find news or political information, 33.3% of participants used Twitter, 20% used Facebook, 16.7% use Instagram, 11.7% used Snapchat or Reddit, 5% used LinkedIn and 1.7% used another SNS. Notably, all participants used at least one SNS platform to stay informed about current events and politics.

This study examined the user behavior and interaction with a researcher-created news-sharing SNS called *The Hive*. Participants were told that *The Hive* is a new platform where users share news articles with their friends. Like other popular SNSs, users could interact with the content by clicking on and reading news articles and by liking, commenting, or sharing the posts. To run this study, three versions of *The Hive* were developed. While all versions of the site displayed the same articles in the news feed, the two manipulated versions contained tweaks to the interface. Because the main function of the site is sharing news, the manipulations were added in an attempt to cue the user to read and interact with the articles

actively, rather than passively. One manipulation, which will be called the “read version” of the site, added a button beneath the post and to the left of the like button that had a document icon and the text “Read.” The other version of the site, called the “warning version,” was like the control version of the site in all manners except false news stories were given an orange banner with a label that had an exclamation mark icon and read “Rated false – our fact checkers dispute the accuracy of this article.”

While elements of the interface varied, the content and order of posts in the news feeds remained constant. Each post was posted by a user with a stock image profile photo and a name from a random name generator. See Appendix A, B, and C for an example of a post in the news feed. The news feeds were composed of news stories from a variety of reputable news outlets including *BBC*, *The New York Times*, and *The Atlantic*. Among these news stories, there were 2 news stories that were reported to be false by the nonprofit, nonpartisan, fact checking organization, *FactCheck.org*. In total, 25 news stories were displayed in the feed.

To collect the data, screen recording software captured each user’s online session. In the screen recording, the number of clicks, location of mouse, text input, and length of session was noted. After looking through the news feed, a survey was completed to collect demographic information along with information about what SNS(s) each participant uses and how often they look at news.

In this study, three independent variables were examined. The independent variables were the version of *The Hive* that the user was assigned. Each participant was randomly assigned to the control, read, or warning versions of the site. Dependent variables examined included the number of times a user clicked on the post (to read the article), liked, commented, or shared the post, and the amount of time spent on the site. A click to read the article only

counted if the user was taken to the next page. Similarly a comment was only counted if the user clicked the “Post” button after typing it. Clicks were counted as likes or shares if the user clicked that area’s text or icon. Other dependent variables included whether or not users viewed an article before liking, commenting, or sharing it.

The user’s level of media literacy was also observed. In this study, media literacy was defined by the number of times a user liked, commented on, or shared a post without clicking the article first. The number of likes, comments, or shares that preceded reading the article was then divided by the users total number of likes, comments, and shares. Users whose interactions with an article before clicking it was less than 33.3% were classified as participants with a high level of media literacy. Accordingly, users who liked, commented on, or shared a post before reading between 33.3% and 66.7% of their number of likes, comments, and shares were classified as users with medium levels of media literacy and users whose interactions with a post before reading it made up 66.7% to 100% of their total interactions were classified as having low levels of media literacy.

Participants arrived at the study location where laptops had the website pre-loaded. After arriving, participants were given a brief presentation about *The Hive*. *The Hive* was pitched as a new, news sharing social media platform where users could read, like, comment on, and share news stories with their followers. After showing users how they could interact with the site, participants were asked to scroll through the news feed and wait for further instruction if they reached the bottom of the feed. Once 10 minutes had elapsed, the participants were instructed to close *The Hive* and complete a brief survey about their SNS use, news habits, and demographics. After completing the survey, participants were given a debrief handout that contained information about the false news stories.

Results

Control Version

Participants assigned to use the control version of the site displayed varying levels of media literacy; 60% of users showed high levels of media literacy, 40% displayed low levels of media literacy, and none of the users assigned to this group showed medium levels of media literacy. Users with high levels of media literacy in this group ($M = 5.44$, $SD = 2.74$, $N = 9$) clicked on more posts than participants with low levels of media literacy ($M = 2.50$, $SD = 1.76$, $N = 6$) $t = 2.32$, $p = 0.04$. However, there was no significant difference between the number of times a media literate participant liked ($M = 2.00$, $SD = 2.60$, $N = 9$), commented ($M = 0$, $SD = 0$, $N = 9$), or shared ($M = 0.11$, $SD = 0.33$, $N = 9$) a post on the site and the number of times a less media literate participant liked ($M = 3.83$, $SD = 3.31$, $N = 6$), commented ($M = 1.00$, $SD = 2.45$, $N = 6$), or shared ($M = 2.00$, $SD = 3.52$, $N = 6$) a post $t = -1.20$, $p = 0.25$; $t = -1.25$, $p = 0.23$; $t = -1.63$, $p = 0.13$, respectively.

“Read Article” Button Version

Contrary to the results expected in H1 - H3, this study found no significant relationship between adding a “read article” button ($M = 4.27$, $SD = 2.76$, $N = 15$) and the number of posts clicked on the control version ($M = 4.27$, $SD = 2.25$, $N = 15$) $t = 0$, $p = 1$. There were also no significant results found between the number of likes ($M = 3.20$, $SD = 2.68$, $N = 15$), comments ($M = 0.33$, $SD = 0.62$, $N = 15$), or shares ($M = 0.40$, $SD = 0.74$, $N = 15$) received on all posts in the read article version and the number of likes ($M = 2.73$, $SD = 2.94$, $N = 15$), comments ($M = 0.40$, $SD = 1.55$, $N = 15$), or shares ($M = 0.87$, $SD = 2.33$, $N = 15$) on the control version $t = -0.46$, $p = 0.65$; $t = 0.16$, $p = 0.88$; $t = 0.74$, $p = 0.47$, respectively. Further, there was no significant relationship between the total number of clicks, likes, comments, and shares on the control (M

= 8.27, $SD = 6.375$, $N = 15$) and read article ($M = 8.20$, $SD = 4.21$, $N = 15$) versions of the site $t = 0.34$, $p = 0.97$.

There was also no significant relationship between the number of clicks ($M = 3.80$, $SD = 2.46$, $N = 15$), likes ($M = 3.07$, $SD = 2.46$, $N = 15$), comments ($M = 0.27$, $SD = 0.59$, $N = 15$), and shares ($M = 0.33$, $SD = 0.62$, $N = 15$) that true posts received on the read article version and the number of clicks ($M = 3.73$, $SD = 2.46$, $N = 15$), likes ($M = 2.60$, $SD = 2.69$, $N = 15$), comments ($M = 0.27$, $SD = 1.03$, $N = 15$), and shares ($M = 0.80$, $SD = 2.08$, $N = 15$) true posts received on the control version of *The Hive* $t = -0.78$, $p = 0.94$; $t = -0.50$, $p = 0.62$; $t = 0$, $p = 1$; $t = 0.83$, $p = 0.41$, respectively. Similarly, no significant relationship was found between the number of times users' clicked ($M = 0.47$, $SD = 0.74$, $N = 15$), liked ($M = 0.13$, $SD = 0.35$, $N = 15$), commented ($M = 0.70$, $SD = 0.26$, $N = 15$), or shared ($M = 0.07$, $SD = 0.26$, $N = 15$) false posts on the read article version or the number of times users clicked ($M = 0.53$, $SD = 0.74$, $N = 15$), liked ($M = 0.13$, $SD = 0.35$, $N = 15$), commented ($M = 0.13$, $SD = 0.52$, $N = 15$), or shared ($M = 0.07$, $SD = 0.26$, $N = 15$) false posts on the control version $t = 0.25$, $p = 0.81$; $t = 0$, $p = 1$; $t = 0.45$, $p = 0.66$; $t = 0$, $p = 1$.

Within the group assigned to use the read article version of *The Hive*, 46.7% of users displayed high levels of media literacy, 20% showed medium levels of media literacy, and 33.3% of users displayed low levels of media literacy. Notably, users with high levels of media literacy ($M = 1.57$, $SD = 1.51$, $N = 7$) were significantly less likely to like posts than users with lower levels of media literacy ($M = 4.40$, $SD = 2.30$, $N = 5$) $t = -2.59$, $p = 0.03$. Similarly, on the read article manipulation of the site, users with lower levels of media literacy ($M = 6.20$, $SD = 3.77$, $N = 5$) were more likely to have higher total numbers of likes, comments, and shares than users with higher levels of media literacy ($M = 1.86$, $SD = 1.77$, $N = 7$) $t = -2.70$, $p = 0.02$. No notable

differences were found between users with a medium level of media literacy and those with high or low levels of media literacy.

Warning Banner Version

There was no significant relationship $t = -0.97, p = 0.34$ found between the total number of clicks, likes, comments, or shares posts received on the warning banner version ($M = 6.14, SD = 5.30, N = 14$) than the number of interactions received on the control version ($M = 8.27, SD = 6.38, N = 15$). Based on the total number of particular interactions, no significant relationship was found between the number of clicks ($M = 3.14, SD = 2.98, N = 14$), likes ($M = 1.79, SD = 2.12, N = 14$), shares ($M = 0.43, SD = 0.76, N = 14$), and comments ($M = 0.79, SD = 1.31, N = 14$) on the warning version and the number of clicks ($M = 4.27, SD = 2.76, N = 15$), likes ($M = 2.73, SD = 2.34, N = 15$), shares ($M = 0.87, SD = 2.33, N = 15$), and comments ($M = 0.40, SD = 1.55, N = 15$) received on the control version $t = -1.05, p = 0.30; t = -0.99, p = 0.33; t = -0.67, p = 0.51; t = 0.72, p = 0.48$, respectively.

There was also no significant relationship between the number of clicks ($M = 2.86, SD = 2.60, N = 14$), likes ($M = 1.79, SD = 2.12, N = 14$), comments ($M = 0.57, SD = 1.09, N = 14$), and shares ($M = 0.43, SD = 0.76, N = 14$) that true posts received on the warning version of *The Hive* and the number of clicks ($M = 3.73, SD = 2.46, N = 15$), likes ($M = 2.60, SD = 2.69, N = 15$), comments ($M = 0.27, SD = 1.03, N = 15$), and shares ($M = 0.80, SD = 2.08, N = 15$) true posts received on the control version. Users of the warning version of *The Hive* liked ($M = 0, SD = 0, N = 14$) and shared ($M = 0, SD = 0, N = 14$) fewer false posts than users of the control version liked ($M = 0.13, SD = 0.35, N = 15$) or shared ($M = 0.07, SD = 0.26, N = 15$) – but these results were both insignificant $t = -1.42, p = 0.17$ and $t = -.67, p = 0.51$ respectively. However, users of the warning banner version ($M = 0.21, SD = 0.58, N = 14$) of the site were more likely to comment on

false posts than users of the control version ($M = 0.13$, $SD = 0.52$, $N = 15$). These results were also not statistically significant $t = 0.40$, $p = 0.69$.

Within the group of those assigned to use the warning banner version, differences emerged in the ways that users interacted with the content based on their level of media literacy. Of the users in this group, 57.1% displayed high levels of media literacy, 21.4% displayed medium levels of media literacy, and 21.4% of users displayed low levels of media literacy. Users with a medium level of media literacy ($M = 3.33$, $SD = 1.53$, $N = 3$) liked significantly more posts than users with a high level of media literacy ($M = 0.75$, $SD = 1.16$, $N = 8$) $t = -3.04$, $p = 0.01$. No significant differences existed between users with low levels of media literacy and those with high or medium levels of media literacy.

Discussion

While the number of interactions did not significantly differ between the variations of *The Hive*, interesting observations were made about users with differing levels of media literacy. As previously stated, this study classifies users whose percentage of stories that were liked, commented on, or shared before clicking on (or reading) the post was less than 33.3% of their total number of likes, comments, and shares as having high levels of media literacy. Users with 33.3% to 66.7% of likes, comments, or shares before reading were classified as having medium levels of media literacy while users with more than 66.7% of interactions before reading were considered to have low levels of media literacy.

On the control version of *The Hive*, users with higher levels of media literacy were more likely to click on articles than users with low levels of media literacy. Because media literacy is calculated as the number of interactions before reading divided by the total number of interactions, it may seem commonsensical that users with higher levels of media literacy

clicked on more posts. Yet, it is worth noting that users could click on a post without interacting with it afterwards. Therefore, the level of media literacy of the user should not have any bearing on the number of clicks that posts receive. The finding that users with higher levels of medial literacy clicked on more posts than those with lower levels of media literacy support Pennycook and Rand's (2019b) findings that users believe fake news because they fail to think. The impulse action to "like," comment on, or share a post before reading it demonstrates a lack of reasoning. However, whether or not clicking on more articles is a preferable behavior or not is unclear.

An underlying assumption in this study was that a news sharing SNS should be designed in a way that cues active participation and critical thinking – as opposed to passive scrolling and mindless clicking – in the user. While it was not known what cues would encourage this behavior, the goal was to gratify critical thinking and high levels of media literacy. In this way, the finding that users with higher levels of media literacy clicked on more posts was positive. This showed that users with higher levels of media literacy were at least reading a broader variety of posts before deciding what to like, comment on, or share.

However, this finding also suggests that the design of the interface did not encourage users with lower levels of media literacy to read more posts. Because users with lower levels of media literacy liked, commented on, or posted a larger number of posts before reading them, it seems that they may be more likely to share news containing false information – an action that could be prevented by reading more news articles before further interacting with the content. Since these users would benefit the most from being encouraged to click on news stories, further research should be conducted to determine ways to incorporate design cues that would

gratify users with lower levels of media literacy to be more active when consuming news on SNSs.

Further, the finding that users with higher levels of media literacy clicked on more posts might be concerning. The sleeper effect, a phenomenon attributed to Hovland and colleagues (1949, 1951), occurs when a person reads a news story and forgets the credibility cues but remembers the message over time. Hovland and Weiss (1951) hypothesize that people may initially be more suspicious of the communicator's goals when sharing a news message and thus, may show little change of opinion. However, over time, people forget who shared the message but remember the content of the message and are more likely to accept it. The sleeper effect has been examined in online news sharing as well. Heinbach, Ziegele, and Quiring (2018) found that the persuasive effect of comments and source credibility on online news stories disappeared after two weeks while the content of the article still had an effect on the readers' beliefs. This finding raises questions about whether or not it is beneficial for users to read disinformation stories. While users are able to exercise more agency by determining what arguments to accept or reject in false news stories, Heinbach, Ziegele, and Quiring's (2018) study reveals that users may forget source credibility cues while retaining a belief in the content of the article as time passes. Before making interface design decisions to encourage users to read more articles, the sleeper effect should be more fully examined to determine if the benefits of critical thinking and reader agency outweigh the costs produced by the sleeper effect.

While users of the control version of the site with higher levels of media literacy were more likely to click on posts than users with lower levels of media literacy, users with lower levels of media literacy were more likely than high media literacy users to interact in other

ways on the read article and warning versions of the site. On the read article version of the site, users with low levels of media literacy were more likely to like posts than users with a higher level of media literacy. Similarly, on the warning version of the site, users with medium levels of media literacy were more likely to like posts than users with high levels of media literacy. These results are concerning due to the fact that users with low and medium levels of media literacy were less likely to read the post before liking it, suggesting that they are more susceptible to liking disinformation stories.

On the warning version of *The Hive*, this result may be explained by the presence of the warning banner. Perhaps merely seeing the warning banner encourages the users to more passively scroll through their feeds. This phenomenon could be explained by Schwartz's (2000) finding that an overwhelming number of choices overwhelms users, rather than empowering them. SNS news feeds are rife with choices for the user – which posts to read, whether or not to trust the claims made in the posts, when to leave a comment, etc. Because of this, Sundar (2008) writes that the choice heuristic can trigger dissonance and challenge the user's sense of personal control of the platform. By automatically labeling posts as containing false information, the user has one less choice to make, freeing mental space for them to focus on which posts to like, comment on, or share. So, users who see a post that lacks the warning banner may automatically make the judgment that the post contains veracious information and therefore, can be liked. If this explanation is correct, this finding suggests that interface designers of news sharing platforms looking to encourage active participation from users should test other ways to warn users of potentially false content.

It is unclear why low media literacy users of the read article version of the site were more likely to “like” posts. The “read” button was placed immediately to the left of the “like”

button to remind users of the option to read the article before sharing content. Yet, it seems that this manipulation was ineffective at getting users to read the article. However, users of the read article version of *The Hive* who had lower levels of media literacy interacted significantly more with content than users with high levels of media literacy. So, while 66.7 - 100% of these users' likes, comments, or shares happened before or without reading the post, users with low levels of media literacy were almost 3 times more likely to interact with the post than users with higher levels of media literacy. This suggests that the read article version of *The Hive* had the unintended effect of encouraging users with lower levels of media literacy to like, comment on, or share posts more than users with higher levels of media literacy. More research on why this was the case is merited to better understand this result. But, this result might be avoided if users were prompted to be more analytical of the post's content. Pennycook and Rand (2019b) found analytic news readers were better able to determine false news stories from true stories. One explanation for this was that they are better able than less-analytic readers to determine the plausibility of news headline. This finding suggests that one possible way to encourage less media literate users to reflect on the veracity of posts is to prompt them to think of the plausibility of the claims made. Interface modifications that may cue users to think about a post's plausibility include showing alternate headlines that relate to the story from other sources or offering a link to another source that offers basic information about the topic being discussed.

As previously stated, more research on the connection between user behavior, interface design, and the spread of false news could reveal interesting ways to cue users to be more critical of the content that crosses their news feed. Because 100% of the sample tested in this study uses at least one SNS site to get news or political information, it is vital that SNSs are

designed to encourage productive media literacy habits. While this study was unable to support the hypotheses presented, it is notable that several patterns concerning user behavior before reading a post were observed. This suggests that more research in this area could yield significant findings that may be able to slow the spread of disinformation.

Overall, the hypotheses presented in this study were unable to be supported. However, there is reason to believe that these hypotheses *could* be supported with a larger sample size. While there were no significant statistical findings, user behavior and interface design research deserves more attention. These perspectives could yield fruitful results to slow the spread of disinformation.

Limitations

As previously mentioned, one of the greatest limitations of this study was the low sample size recruited. This study required participants to interact with *The Hive* in a lab setting and took place in the spring of 2020. Due to the COVID-19 pandemic, the number of participants was limited by the closure of the university. Having more participants would have likely led to more significant results.

Further, several issues occurred with the technology used to conduct the survey. A few issues with the screen recording software raise concerns with the accuracy of the data collected. This made it difficult to count the number of likes, comments, or shares that a post received before (and after) clicking the post. While each version of *The Hive* was tested several times before being used in the study, a few issues made it through to the final version of the sites. These issues were minor, but may have affected the users' overall experience on the site.

Conclusion

A wealth of uses and gratifications research reveals people's motivations for using SNSs. However, as Smock et al. (2011) argue, these platforms are rapidly changing and offering users new ways to interact with content. Rather than taking a uses and gratifications approach to unbundling feature use of platforms like Facebook (e.g. Smock et al., 2011), this study examined patterns of user behavior on a SNS website with false news posts. The manipulated interface elements tested in this study drew from uses and gratifications tradition in an attempt to gratify and cue behaviors associated with critical thinking. The study revealed interesting user behavior patterns that merit further investigation. Further research in this area may reveal design changes that may be put in place to slow the spread of disinformation.

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Appendix A

Sample post on the control version of *The Hive*



Leslie Wyles
February 23rd at 9:32 PM

Awesome interactive article about Finland's plan to be carbon-neutral in 15 years.




bbc.co.uk

Carbon-Neutral In 15 Years? The Country With An Ambitious Plan


♥ 13 💬 2

♡ Like 💬 Comment ➦ Share

 Reply to Leslie's post... Post


Appendix B

Sample post on the read article version of *The Hive*



Leslie Wyles
February 23rd at 9:32 PM





Awesome interactive article about Finland's plan to be carbon-neutral in 15 years.




bbc.co.uk

Carbon-Neutral In 15 Years? The Country With An Ambitious Plan


♥ 13 💬 2

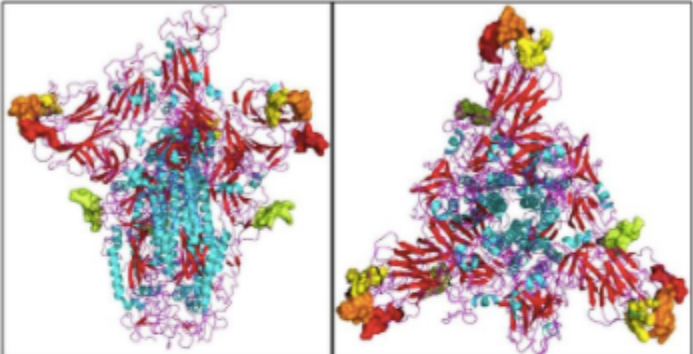
 Read  Like  Comment  Share





 Reply to Leslie's post... Post

Appendix C

Sample false post on the warning version of *The Hive*

 **Trevor Lewis**
February 23rd at 10:38 AM



Insert 1 > TNGTKR		Insert 2 > HKNNKS	
Insert 3 > RSYL--TPGDSSSG		Insert 4 > QTNSFRRA	


Rated False - our factcheckers dispute the accuracy of this article.

zerohedge.com

Coronavirus Contains "HIV Insertions", Stoking Fears Over Artificially Created Bioweapon

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