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# COMBATING FAKE NEWS IN THE DIGITAL AGE

Joanna M. Burkhardt

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## Abstract

The issue of fake news has become very prominent in recent months. Its power to mislead and misinform has been made evident around the world. While fake news is not a new phenomenon, the means by which it is spread has changed in both speed and magnitude. Social media platforms like Facebook, Twitter, and Instagram are fertile ground for the spread of fake news. Algorithms known as bots are increasingly being deployed to manipulate information, to disrupt social media communication, and to gain user attention. While technological assistance to identify fake news are beginning to appear, they are in their infancy. It will take time for programmers to create software that can recognize and tag fake news without human intervention. Even if technology can help to identify fake news in the future, those who seek to create and provide fake news will also be creating the means to continue, creating a loop in which those who want to avoid fake news are always playing catch up.

Individuals have the responsibility to protect themselves from fake news. It is essential to teach ourselves and our students and patrons to be critical consumers of news. This issue of *Library Technology Reports* (vol. 53, no. 8), "Combating Fake News in the Digital Age," is for librarians who serve all age levels and who can help by teaching students both that they need to be aware and how to be aware of fake news. Library instruction in how to avoid fake news, how to identify fake news, and how to stop fake news will be essential.

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# Contents

Chapter 3

# Can Technology Save Us?

## Technology of Fake News

Fake news sites target the filter bubbles of groups most aligned with that news. They use the power of social media to do so. Initially fake news of the social media era was relatively easy to spot. The claims of early social media fake news purveyors were often meant as entertainment. Language, fonts, and links were often indicators that could be used to determine veracity. It took only a short time for fake news to become more insidious, more plentiful, more subtle, and subverted for manipulation of information and public opinion. Fake news has many new social media outlets where it can appear and can spread quickly via both human and nonhuman actors. During the 2016 presidential election cycle for example, fake news appeared often.[1] Determining what news was to be believed and what news was to be ignored became more a case of party affiliation than good sense.

Fake news sites and stories are shared for many different reasons. Some readers find the stories amusing. Some find them alarming. Others find them affirming of their beliefs. Many people share fake news without ever having read the content of the article.[2] Sharing of fake news, whether because it is amusing or because people think it is real, only exaggerates the problem. Did Pope Francis endorse candidate Donald Trump? No, but that didn't stop the story from appearing on social media and spreading widely.[3] Did Hillary Clinton run a child sex ring out of a Washington, DC, pizza shop? No, but that didn't stop a man with a gun from going there to exact vengeance.[4]

In the early days of the internet, fake news was not a big problem. There were some websites that sought to spoof, mislead, or hoax, but mostly it was all in good fun. While some websites sought to spread misinformation, their numbers were limited. It seemed as if the authority to shut down malicious websites was invoked more often. Creating a website on the early internet took time, effort, and computer programming skills that limited the number of people who could create fake news sites.

During the last decade, as an offshoot of the stream of information provided by the internet, social media platforms, such as Facebook and MySpace, were invented so that individuals could connect with others on the internet to point them to websites, share comments, describe events, and so on.

Following that came the invention of another type of social media—Twitter—which allows people to send very brief messages, usually about current events, to others who choose to receive those messages. One could choose to "follow" former President Barak Obama's Twitter postings—to know where he is going, what is on his agenda, or what is happening at an event. This kind of information can be very useful for getting on-site information as it happens. It has proved useful in emergency situations as well. For example, during the Arab Spring uprisings, Twitter communications provided information in real time as events unfolded.[5] During Hurricane Sandy, people were able to get localized and specific information about the storm as it happened.[6] Twitter is also a convenient means of socializing, for getting directions, and for keeping up-to-date on the activities of friends and family.

The power of the various tools that use the power of the internet and the information supplied there is epic. The spread of the technology required to make use of these tools has been rapid and global. As with most tools, the power of the internet can be used for both good and evil. In the last decade, the use of the

internet to manipulate, manage, and mislead has had a massive upswing.

## Big Data

The collection of massive amounts of data using bots has generated a new field of study known as "big data."[7] Some big data research applies to the activities of people who use the internet and social media. By gathering and analyzing large amounts of data about how people use the internet, how they use social media, what items they like and share, and how many people overall click on a link, advertisers, web developers, and schemers can identify what appear to be big trends. Researchers are concerned that big data can hide biases that are not necessarily evident in the data collected, and the trends identified may or may not be accurate.[8] The use of big data about social media and internet use can result in faulty assumptions and create false impressions about what groups or people do or do not like. Manipulators of big data can "nudge" people to influence their actions based on the big data they have collected.[9] They can use the data collected to create bots designed to influence populations.[10]

## Bots

Information-collecting capabilities made possible by harnessing computer power to collect and analyze massive amounts of data are used by institutions, advertisers, pollsters, and politicians. Bots that collect the information are essentially pieces of computer code that can be used to automatically respond when given the right stimulus. For example, a bot can be programmed to search the internet to find particular words or groups of words. When the bot finds the word or words it is looking for, its programming makes note of the location of those words and does something with them. Using bots speeds up the process of finding and collecting sites that have the required information. The use of bots to collect data and to send data to specific places allows research to progress in many fields. They automate tedious and time-consuming processes, freeing researchers to work on other tasks.

Automated programming does good things for technology. There are four main jobs that bots do: "Good" bots crawl the web and find website content to send to mobile and web applications and display to users. They search for information that allows ranking decisions to be made by search engines. Where use of data has been authorized, the data is collected by bot "crawlers" to supply information to marketers. Monitoring bots can follow website availability and monitor the proper functioning of online features.

This kind of data collection is useful to those who want to know how many people have looked at the information they have provided. "In 1994, a former direct mail marketer called Ken McCarthy came up with the clickthrough as the measure of ad performance on the web. The click's natural dominance built huge companies like Google and promised a whole new world for advertising where ads could be directly tied to consumer action."[11] Counting clicks is a relatively easy way to assess how many people have visited a website. However, counting clicks has become one of the features of social media that determines how popular or important a topic is. Featuring and repeating those topics based solely on click counts is one reason that bots are able to manipulate what is perceived as popular or important. Bots can disseminate information to large numbers of people. Human interaction with any piece of information is usually very brief before a person passes that information along to others. The number of shares results in large numbers of clicks, which pushes the bot-supplied information into the "trending" category even if the information is untrue or inaccurate. Information that is trending is considered important.

Good bots coexist in the technical world with "bad" bots. Bad bots are not used for benign purposes, but rather to spam, to mine users' data, or to manipulate public opinion. This process makes it possible for bots to harm, misinform, and extort. The *Imperva Incapsula* "2016 Bot Traffic Report" states that approximately 30 percent of traffic on the internet is from bad bots. Further, out of the 100,000 domains that were studied for the report, 94.2 percent experienced at least one bot attack over the ninety-day period of the study.[12] Why are bad bots designed, programmed, and set in motion? "There exist entities with both strong motivation and technical means to abuse online social networks—from individuals aiming to artificially boost their popularity, to organizations with an agenda to influence public opinion. It is not difficult to automatically target particular user groups and promote specific content or views. Reliance on social media may therefore make us vulnerable to manipulation."[13]

In social media, bots are used to collect information that might be of interest to a user. The bot crawls the internet for information that is similar to what an individual has seen before. That information can then be disseminated to the user who might be interested. By using keywords and hashtags, a website can attract bots searching for specific information. Unfortunately, the bot is not interested in the truth or falsehood of the information itself.

Some social bots are computer algorithms that "automatically produce content and interact with humans on social media, trying to emulate and possibly alter their behavior. Social bots can use spam malware, misinformation slander or even just noise"

to influence and annoy.[14] Political bots are social bots with political motivations. They have been used to artificially inflate support for a candidate by sending out information that promotes a particular candidate or disparages the candidate of the opposite party. They have been used to spread conspiracy theories, propaganda, and false information. Astroturfing is a practice where bots create the impression of a grassroots movement supporting or opposing something where none exists. Smoke screening is created when a bot or botnet sends irrelevant links to a specific hashtag so that followers are inundated with irrelevant information.

> When disguised as people, bots propagate negative messages that may seem to come from friends, family or people in your crypto-clan. Bots distort issues or push negative images of political candidates in order to influence public opinion. They go beyond the ethical boundaries of political polling by bombarding voters with distorted or even false statements in an effort to manufacture negative attitudes. By definition, political actors do advocacy and canvassing of some kind or other. But this should not be misrepresented to the public as engagement and conversation. Bots are this century's version of push polling, and may be even worse for society.[15]

Social bots have become increasingly sophisticated, such that it is difficult to distinguish a bot from a human. In 2014, Twitter revealed in a SEC filing that approximately 8.5 percent of all its users were bots, and that number may have increased to as much as 15 percent in 2017.[16] Humans who don't know that the entity sending them information is a bot may easily be supplied with false information.

## Experiments in Fake News Detection

Researchers have studied how well humans can detect lies. Bond and DePaulo analyzed the results of more than 200 lie detection experiments and found that humans can detect lies in text only slightly better than by random chance.[17] This means that if a bot supplies a social media user with false information, that person has just a little better than a 50 percent chance of identifying the information as false. In addition, because some bots have presented themselves and been accepted by humans as "friends," they become trusted sources, making the detection of a lie even more difficult.

To improve the odds of identifying false information, computer experts have been working on multiple approaches to the computerized automatic recognition of true and false information.[18]

### Written Text

Written text presents a unique set of problems for the detection of lies. While structured text like insurance claim forms use limited and mostly known language, unstructured text like that found on the web has an almost unlimited language domain that can be used in a wide variety of contexts. This presents a challenge when looking for ways to automate lie detection. Two approaches have been used recently to identify fake news in unstructured text. Linguistic approaches look at the word patterns and word choices, and network approaches look at network information, such as the location from which the message was sent, speed of response, and so on.[19]

### Linguistic Approaches to the Identification of Fake News

The following four linguistic approaches are being tested by researchers:

In the Bag of Words approach, each word in a sentence or paragraph or article is considered as a separate unit with equal importance when compared to every other word. Frequencies of individual words and identified multiword phrases are counted and analyzed. Part of speech, location-based words, and counts of the use of pronouns, conjunctions, and negative emotion words are all considered. The analysis can reveal patterns of word use. Certain patterns can reliably indicate that information is untrue. For example, deceptive writers tend to use verbs and personal pronouns more often, and truthful writers tend to use more nouns, adjectives, and prepositions.[20]

In the Deep Syntax approach, language structure is analyzed by using a set of rules to rewrite sentences to describe syntax structures. For example, noun and verb phrases are identified in the rewritten sentences. The number of identified syntactic structures of each kind compared to known syntax patterns for lies can lead to a probability rating for veracity.[21]

In the Semantic Analysis approach, actual experience of something is compared with something written about the same topic. Comparing written text from a number of authors about an event or experience and creating a compatibility score from the comparison can show anomalies that indicate falsehood. If one writer says the room was painted blue while three others say it was painted green, there is a chance that the first writer is providing false information.[22]

In Rhetorical Structure (RST), the analytic framework identifies relationships between linguistic elements of text. Those comparisons can be plotted on a graph, Vector Space Modeling (VSM) showing how close to the truth they fall.[23]

### Networks

In approaches that use network information, human classifiers identify instances of words or phrases that are indicators of deception. Known instances of words used to deceive are compiled to create a database. Databases of known facts are also created from various trusted sources.[24] Examples from a constructed database of deceptive words or verified facts can be compared to new writing. Emotion-laden content can also be measured, helping to separate feeling from facts. By linking these databases, existing knowledge networks can be compared to information offered in new text. Disagreements between established knowledge and new writing can point to deception.[25]

Social Network Behavior using multiple reference points can help social media platform owners to identify fake news.[26] Author authentication can be verified from internet metadata.[27] Location coordination for messages can be used to indicate personal knowledge of an event. Inclusion or exclusion of hyperlinks is also demonstrative of trustworthy or untrustworthy sources. (For example, TweetCred, available as a browser plugin, is software that assigns a score for credibility to tweets in real time, based on characteristics of a tweet such as content, characteristics of the author, and external URLs.[28]) The presence or absence of images, the total number of images by multiple sources, and their relationships and relevance to the text of a message can also be compared with known norms and are an indicator of the truth of the message. Ironically, all of this information can be collected by bots.

## Experiments in Bot and Botnet Detection

A variety of experiments have been conducted using multiple processes to create a score for information credibility.[29] Research groups are prepared to supply researchers with data harvested from social media sites. Indiana University has launched a project called Truthy.[30] As part of that project, researchers have developed an "Observatory of Social Media." They have captured data about millions of Twitter messages and make that information available along with their analytical tools for those who wish to do research. Their system compares Twitter accounts with dozens of known characteristics of bots collected in the Truthy database to help identify bots.

Truthy
http://truthy.indiana.edu/about/

DARPA, Defense Advanced Research Projects Agency, is a part of the US Department of Defense. It is responsible for the development of emerging technologies that can be used by the US military. In early 2015, DARPA sponsored a competition whose goal was to identify bots known as influence bots. These bots are "realistic, automated identities that illicitly shape discussions on social media sites like Twitter and Facebook, posing a risk to freedom of expression."[31] If a means of identifying these bots could be discovered, it would be possible to disable them. The outcome of the challenge was that a semi-automated process that combines inconsistency detection and behavioral modeling, text analysis, network analysis, and machine learning would be the most effective means of identifying influence bots. Human judgment added to the computer processes provided the best results.

Many other experiments in the identification of bots have been reported in the computer science literature.[32] Bots and botnets often have a specific task to complete. Once that task is completed, their accounts are eliminated. Detecting bots and botnets before they can do harm is critical to shutting them down. Unfortunately, the means for detecting and shutting down bots are in their infancy. There are too many bot-driven accounts and too few means for eliminating them.

What happens to the information that bots collect is one part of the story of fake news. During the 2016 US presidential campaign, the internet was used to advertise for political candidates. Official campaign information was created by members of each politician's election team. News media reported about candidates' appearances, rallies, and debates, creating more information. Individuals who attended events used social media to share information with their friends and followers. Some reports were factual and without bias. However, because political campaigns involve many people who prefer one candidate over another, some information presented a bias in favor of one candidate or not favoring another candidate.

Because it is possible for anyone to launch a website and publish a story, some information about the political candidates was not created by any official of the campaign. In fact, many stories appeared about candidates that were biased, taken out of context, or outright false. Some stories were meant as spoof or satire; others were meant to mislead and misinform. One story reported that the pope had endorsed presidential candidate Donald Trump. In any other context, the reader would likely have no trouble realizing that this story was not true.

Enter the bots. There have been some alarming changes in how, where, and for what bots are used in the past ten years. Bots are being programmed to collect information from social media accounts and push information to those accounts that meet certain criteria.

> Social networks allow "atoms" of propaganda to be directly targeted at users who are more likely to accept and share a particular message. Once they inadvertently share a misleading or fabricated article, image video or meme, the next person who sees it in their social feed probably trusts the original poster, and goes on to share it themselves. These "atoms" then rocket through the information ecosystem at high speed powered by trusted peer-to-peer networks.[33]

Political bots have been central to the spread of political disinformation. According to Woolley and Guilbeault, the political bots used in the 2016 US elections were primarily used to create manufactured consensus:

> Social media bots manufacture consensus by artificially amplifying traffic around a political candidate or issue. Armies of bots built to follow, retweet, or like a candidate's content make that candidate seem more legitimate, more widely supported, than they actually are. Since bots are indistinguishable from real people to the average Twitter or Facebook user, any number of bots can be counted as supporters of candidates or ideas. This theoretically has the effect of galvanizing political support where this might not previously have happened. To put it simply: the illusion of online support for a candidate can spur actual support through a bandwagon effect.[34]

The Computational Propaganda Research project has studied the use of political bots in nine countries around the world. In Woolley and Guilbeault's report on the United States, the authors state, "Bots infiltrated the core of the political discussion over Twitter, where they were capable of disseminating propaganda at mass-scale. Bots also reached positions of high betweenness centrality, where they played a powerful role in determining the flow of information among users.[35]

Social bots can affect the social identity people create for themselves online. Bots can persuade and influence to mold human identity.[36] Guilbeault argues that online platforms are the best place to make changes that can help users form and maintain their online identity without input from nonhuman actors. To do that, researchers must identify and modify features that weaken user security. He identifies four areas where bots infiltrate social media:

1. Users create profiles to identify themselves on a social media platform. It is easy for bots to be programmed to provide false information to create a profile. In addition, the accessibility of the information in the profiles of other social media users is relatively easy to use to target specific populations.
2. In person, humans rely of a wide range of signals to help determine whether or not they want to trust someone. Online users have more limited options, making it much easier for bots to pretend to be real people. For platforms like Twitter, it is significantly easier to imitate a human because the text length is short and misspellings, bad grammar, and poor syntax are not unusual. Guilbeault indicates that popularity scores are problematic. He suggests, for example, "making popularity scores optional, private, or even nonexistent may significantly strengthen user resistance to bot attacks."[37]
3. People pay attention to their popularity in social media. A large number of friends or followers is often considered to be a mark of popularity. That can lead to indiscriminate acceptance of friend requests from unknown individuals, providing a place for social bots to gain a foothold. Bots send out friend requests to large numbers of people, collect a large following, and, as a result, become influential and credible in their friend group.
4. The use of tools such as emoticons and like buttons help to boost the influence of any posting. Bots can use the collection of likes and emoticons to spread to other groups of users. This process can eventually influence topics that are trending on Twitter, creating a false impression of what topics people are most interested at a given time. This can, of course, deflect interest in other topics.[38]

While Guilbeault has identified practices on social media platforms where improvements or changes could be made to better protect users, those changes have yet to be made. A groundswell of opinion is needed to get the attention of social media platform makers. The will to remove or change a popular feature such as popularity rating doesn't seem likely in the near future. In fact, while research is being done in earnest to combat the automated spread of fake or malicious news, it is mostly experimental in nature.[39] Possible solutions are being tested, but most automatic fake news identification software is in its infancy. The results are promising in some cases, but wide application over social media platforms is nowhere in sight. The research that exists is mostly based on identifying and eliminating accounts that can be shown to be bots. However, by the time that has been accomplished, whatever the bot has been programmed to do has already been done. There are very few means to automatically identify bots and botnets and disable them before they complete a malicious task.

## Google and Facebook Anti-Fake News Efforts

The social media platforms and search engines themselves have made some efforts to help detect and flag fake news. Facebook created an "immune system" to

help protect itself from infection by bots.[40] Google announced that it will increase its regulation of advertising and linked-to websites.[41] Facebook has turned over the verification of information to five leading fact-checking organizations.[42] Facebook has also initiated a feature in parts of Europe called Related Articles, which provides readers with access to the results of fact-checking of original stories.[43] Google Digital News Initiative is creating programs to help users verify information themselves with Factmata. Overall, these attempts are reactive at best. The sheer volume of potential misinformation and the difficulty in identifying and shutting down bot accounts make these attempts seem feeble.

*Factmata*
http://factmata.com/

It seems that the battle of the computer programmers will continue indefinitely. When one side develops a new means of manipulating information to mislead, misinform, or unduly influence people, the other side finds a way to counter or at least slow the ability to make use of the new idea. This cycle continues in a seemingly endless loop. Using technology to identify and stop fake news is a defensive game. There does not appear to be a proactive means of eliminating fake news at this time. Money, power, and political influence motivate different groups to create computer-driven means of human control.

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Chapter 5

# How Can We Help Our Students?

## Teach Information or Media Literacy

Students today have never lived in a world without computers and cellphones. They have always been immersed in technology and bombarded with information. This is normal for them. They use technology easily and accept new technology readily. They are willing to experiment and are quick to discard anything that is not entertaining or that takes too long to complete. They live in a world of 3-D, virtual reality, and predictive searching. They have a preference for visual rather than written material. They skim the surface of the information they receive, rather than doing a deep dive to thoroughly research a topic. They expect technology to work for them, at lightning speed, without the need for instruction or intervention.

Most people are confident that they know more than they do. Experiments conducted by David Dunning and Justin Kruger in 1999 showed that people who know relatively little about a subject are overconfident about their level of expertise in it.[1] The "Dunning-Kruger effect" finds that students and others overestimate what they know, despite knowing that they lack experience or knowledge of the subject. People in general tend to trust their social media friends, and students in particular tend to rely on social media for their information. The sources of information they trust are the ones their friends share with them. The expertise of the author, the possible bias of the producer, the geographic location of the creator, the facts that back up an assertion or claim, all take a back seat to the credibility of their friend network. This makes them particularly susceptible to manipulation. If they happen to have unknowingly friended a bot that feeds them misinformation, they are likely to believe that information.

Helping individuals learn to be information- or media-literate is one of the single most important skills we can offer. It translates into the ability to understand, control, and apply information. In order to combat fake news, the first step should be to start teaching students early in their education. By the time students get to high school, which is typically the first place they encounter "information literacy" today, their learning habits are ingrained. We need to teach basic information literacy skills much earlier in life, and we need to repeat lessons throughout a student's education.

Psychologically, the first thing we see or hear about a topic is what we remember as true. The more times we hear something repeated, the more likely it is that we will remember it, even if it is not true.[2] To start students on the road to information or media literacy, we need to start teaching those skills in elementary school so that critical thinking and questioning will become ingrained and habitual. We need to capitalize on children's propensity to ask questions and encourage them to do so. We also need to help them learn how to find answers to their questions. A scaffolded curriculum of information literacy across the K–12 system would build a foundation that students could use to approach adult problems after graduation.

Students need guidance as they often lack life experience. Teaching students to seek out experts and to value those who have expertise in a subject will provide them with a key to avoiding fake news. With the democratization of access to information via the internet, it is easy to find information, but is it not

always easy to determine if that information came from an expert and trustworthy source.[3] Students should understand that information coming from an expert source will be more reliable than information coming from an unknown source. Teachers should provide guidelines for students to use in identifying and selecting information supplied by experts.

As students reach high school, their tendency is to rely less on the expertise of their teachers and rely more on their friends. This is problematic in terms of fake news because many students get their news only from their social media newsfeed. Teens often share news they have received via social media because a headline or a picture, rather than the actual content of an article, has caught their attention. They are often unaware that they are receiving information from bots driven by algorithms based on the likes, shares, and clicks at their social media pages. They are often unaware that the information they see can be influenced by nonhuman actors. Students often do not seek out alternate sources of information, nor do they compare information to see how details might differ. We need to encourage them to do so and show them how. Technological interventions that are entertaining as well as instructive can help to get information across to teens.

## Make Students Aware of Psychological Processes

Knowledge is power. When we are aware that we are psychologically programmed to believe information first and then reject it later if necessary, it becomes easier to insert skepticism into our analysis of news. This makes it easier to reject fake news if we can initially accept that it might be fake news. It is easier to dismiss the initial misinformation if we know our brain has a tendency to hold onto it. Explaining the psychological tendencies that could cause students to believe fake news, and reminding them of those tendencies periodically, can give them a means of examining that news more critically. Making students aware of how their brains are working can improve their performance.[4]

In college, students are often psychologically ready for a fresh start or at least exhibit a willingness to consider new ideas. At this critical juncture, it is important to provide the reasoning and the instruction that will help them to apply their critical-thinking skills to their new environment. The freshman experience concerning information literacy can be very important, as it can, if successful, create the basis for the rest of their college work. It is important to introduce academically related information-literacy concepts and skills at a time when they can be applied immediately to an assignment or problem. Skills concerning fake news can be taught any time as fake news is a "hot topic" in the nonacademic world, and students will have the opportunity to apply what they learn immediately in their personal lives. Workshops, tutorials, YouTube videos, and games can be created based on the topic of fake news. The information-literacy skills conveyed in the exercises about fake news can be applied immediately, but can also be transferred to academic issues at the appropriate time.

## Tie Information Literacy to Workplace Applications

Building a curriculum to serve college students is critical to producing the workforce practices employers are looking for. It is critical to tie information literacy to the world outside academia and beyond college. Students need to know how important the information literacy skills are going to be to their future success in the working world.[5] Most students will not have access to the research databases available to them at the university level once they move into the working world. Students are usually familiar with common platforms such as Google and Facebook. Lessons involving Google and social media platforms can provide a focus for instruction using sources students might have available to them as workers and that they will certainly use in their everyday lives. Tips, shortcuts, and cautions can center on the issue of fake news, to make a class or workshop content relevant while teaching valuable skills.

The information literacy skills and concepts students are taught need to be offered in memorable ways, across the curriculum. Offer students instruction options in as many media as possible. Remember students today are visual people for the most part. They don't read deeply, and they tend to reject anything that has no entertainment value. A YouTube video can have more impact than an in-class demonstration. A comic book about information literacy problem solving can be more memorable than a checklist handout. Make sure the tools you make available are easily accessible electronically. A problem-solving online game can be effective as well as entertaining. Having students create information literacy projects centered on issues they feel are important could offer them an opportunity for deeper understanding of the subject and provide valuable insight. Get input from students about what teaching tools they find most effective and compelling.

Collaborate with a film studies class, an art class, or a computer engineering class to address information literacy topics in new and interesting ways. Partner with other instructors as often as possible to allow students to get information literacy training in more than one setting, while they are learning another

subject. This will allow students to understand the applicability of information literacy to other subjects.

Have students work on hands-on exercises that demonstrate the need for care in selecting sources. In memory studies, it has been shown that people remember better if they have done something themselves.[6] Rather than telling or showing students how to find a source or check for factuality, plan instruction so that the students do the work, guided by the teacher. Go the next step and have students apply what they learn in one setting to a problem in another setting. It has also been shown that students benefit from working in groups. Allowing instruction to take place in small groups with input as necessary from a roaming instructor will help students to learn from one another and to better remember what they learned.

## Teach Students to Evaluate Information

Teach students about author credentials and how to evaluate them. *Credential* is a term librarians often use, but many students do not know exactly what the term means. What is a credential? What credentials are legitimate indicators of expertise? Acceptable credentials will vary from subject to subject, so the definition is hard to pin down. Academic researchers often try to use sources with peer-review processes in place to do the vetting of authors for them. Unfortunately, in daily life those academic sources do not always serve. They require extra steps to access, and they often require affiliation with an organization that supplies the sources. Most people receiving news from social media are not likely to check that news against an academic database or other reliable source in any case. It can be time consuming to discover an author's credentials. Students will benefit from instruction in what constitutes a credential, where to find evidence of credentials, and why it's worth the time it takes to discover an author's credentials.

In the same way, students should be encouraged to think about bias. Everyone has biases that shape their worldview. That worldview has an impact on the interpretation of events. In reporting on a controversial situation, a journalist should strive for objectivity, but bias can color the representation of the event. It can have an effect on what an eyewitness sees. It can have an effect on the words a reporter chooses when writing a story. Knowing the point of view of the author will help students to identify bias. Biographical information about the author can be helpful in this regard, as is knowing the viewpoint and reputation of the organization the reporter works for. Have students consider, for example, how a reporter working for the NRA might present information about a school shooting. That same school shooting will probably be reported differently by a reporter writing for an anti-gun group. When confronting controversial subjects, students should be given instruction that will help them find information from both sides of the story. Once students understand why the credentials of authors are important and how those credentials inform the reader of possible bias, have a discussion to help them to understand why they should not rely on anonymous sources of information.

## Teach Information Literacy Skills and Concepts

Concentrate on information literacy concepts and skills, rather than teaching students how to use a particular tool. Use those general concepts and skills in concert with exercises that allow students to explore a variety of research tools. Instructors will never have enough time to demonstrate every database for students. It is more efficient to explain to students how databases work in general and then have them use a variety of databases to experience how they differ from one another. Students have been using computer databases most of their lives—Google, Facebook, Twitter—and they frequently learn how to use them by trial and error rather than by reading a help page or following step-by-step instruction sheets. Have them spend their time applying searching and evaluation skills to content rather than learning how to use a particular database.

Make fact-checking sites known and available (see gray box). If students are taught to be skeptical about information, they should have questions about the truth of the news they access. In order to verify news as real or fake, students should be given the tools necessary to do so. Rather than relying on their network of friends or the popularity rating of a post, students should be directed to fact-checking sites, and information about what those sites are should be readily available at multiple locations—websites, social media pages, printable lists, and so on.

*Snopes*
www.snopes.com

*PolitiFact*
www.politifact.com

*FactCheck*
www.factcheck.org

Show students the importance of following up on citations and links. Information literacy instructors have used an article called "Feline Reactions to

Bearded Men" to demonstrate the importance of considering all aspects of an article. The article appears to be reporting the results of a research experiment and is formatted to look like a legitimate research article. It is only when one examines the bibliography that things begin to look suspicious. There are articles listed in the bibliography supposedly authored by Madonna and Dr. Seuss, for example. Nonexistent journals are cited as well.[7] An unwary or novice researcher might be led to believe that the article was reporting on serious research. In the same way, fake news may contain links and citations to articles and other information simply to give the story the look of serious research and reporting. In fact, the links may lead to information that is false, biased, or completely unrelated to the subject. It is important to follow links and citations to verify that they support the claims made in the original piece.

Show students how easy it is to create a fake website using a URL that looks very similar to a legitimate website. Many fake news sites use web addresses that are very similar to the web addresses of legitimate news agencies. It is very easy to assume that the news being displayed is true if one is convinced that the source is legitimate. Unusual add-ons after the domain name, replacement of a capital letter with a small letter, replacing a 1 (numeral one) with an l (lower-case letter L) or vice versa are all tiny details that can make the difference between getting real news and getting fake news.

Teach students to use critical-thinking skills to evaluate a post before they send it on to friends or followers. This could mean training that examines the psychology of memory, the explanation of algorithms and other computer-related processes, or the examination of author credentials. Since librarians typically have a very limited amount of time in which to convey their message, the information must be stripped to the bare essentials for classroom use. This would be a good place to make creative use of technology to create lessons that get the message out electronically, making them available at any time. Lessons online can be assigned for homework or preparation for a class, rather than in a face-to-face class. Make a series of TED-style talks about critical thinking, for example, and post them on the library web page or Facebook page.

Teach students about privacy issues. Students are fairly cavalier about providing personal information online in order to accomplish something. They are often unaware of what happens to the information they supply. Revealing basic information to set up a profile or gain access to a website doesn't seem invasive. However, many groups that ask for basic information sell that information to others.[8] There are groups that buy information from multiple sources, and using the power of computing, put an individual's profile from multiple sites into one file, which may reveal more than one might wish. Individually, the profiles are not necessarily useful, but in the aggregate, they can reveal private information without the knowledge of the individual.

Teach students to slow down. Research shows that the average time spent on a web page is less than fifteen seconds.[9] While this might be enough time to grasp the content of a headline, it is not enough time to examine the meaning of the content or to determine where the information came from. Allowing sufficient time to absorb the content of a page is critical to understanding the message. Taking the time to think about the content of a web page before passing it on to someone else will help to stop the spread of fake news.

## Teach the Teachers

Teach the teachers. While librarians have been immersed in information literacy for decades, other teachers have not necessarily had information literacy at the forefront of their curricular objectives. As the automated provision of information has become unavoidable, and the manipulation of that information for good or evil is now in the hands of anyone with sufficient coding skills to accomplish it, teachers at all levels in all subject areas are ready to benefit from the decades-old expertise of librarians. Librarians should make their information literacy instruction materials readily available and advertise their location. Offer workshops and instruction to faculty and others who influence students. Giving workshops for teachers in the late summer or early fall will help them understand the problems associated with fake news and prepare them to help their students. This is also the time to act as a liaison with writing and tutoring centers of all levels and kinds to share information literacy lessons with them. By teaching the teachers we can expand our reach beyond the fifty-minute one-shot session. Cooperation and collaboration with instructors in every subject area will help students to solidify their skills in information literacy and to avoid fake news.

## Conclusion

The creation and spread of fake news is a problem that seems ingrained in human nature. It has existed for millennia and has been used to sway public opinion, smear reputations, and mislead the unwary. In the digital age, information travels much more widely and much faster than it ever has before. Computer power makes it easy to manipulate huge amounts of data, aggregate data from past and present research, and

democratize access to information. Computer power also makes it easy for those who know how to "game the system" for their own purposes. Fake news online is difficult to identify, its source is difficult to identify, and the means of making it stop are not yet known.

Information literacy focusing on social media and fake news appears to be the best option for allowing students, teachers, and the general public to avoid being taken in by those who create fake news. In the past, people were told, "Don't believe everything you read in the newspaper." More recently, people have been told, "Don't believe everything you see on television." Today the warning must be, "Don't believe everything you see, hear, or read on social media." Healthy skepticism and rigorous evaluation of sources—authors, publishers, and content—are key to avoiding fake news.

## Notes

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